Vol. XLVIII AUGUST 23rd, 1945

FLIGHT

and

AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB ONE SHILLING

Palmer

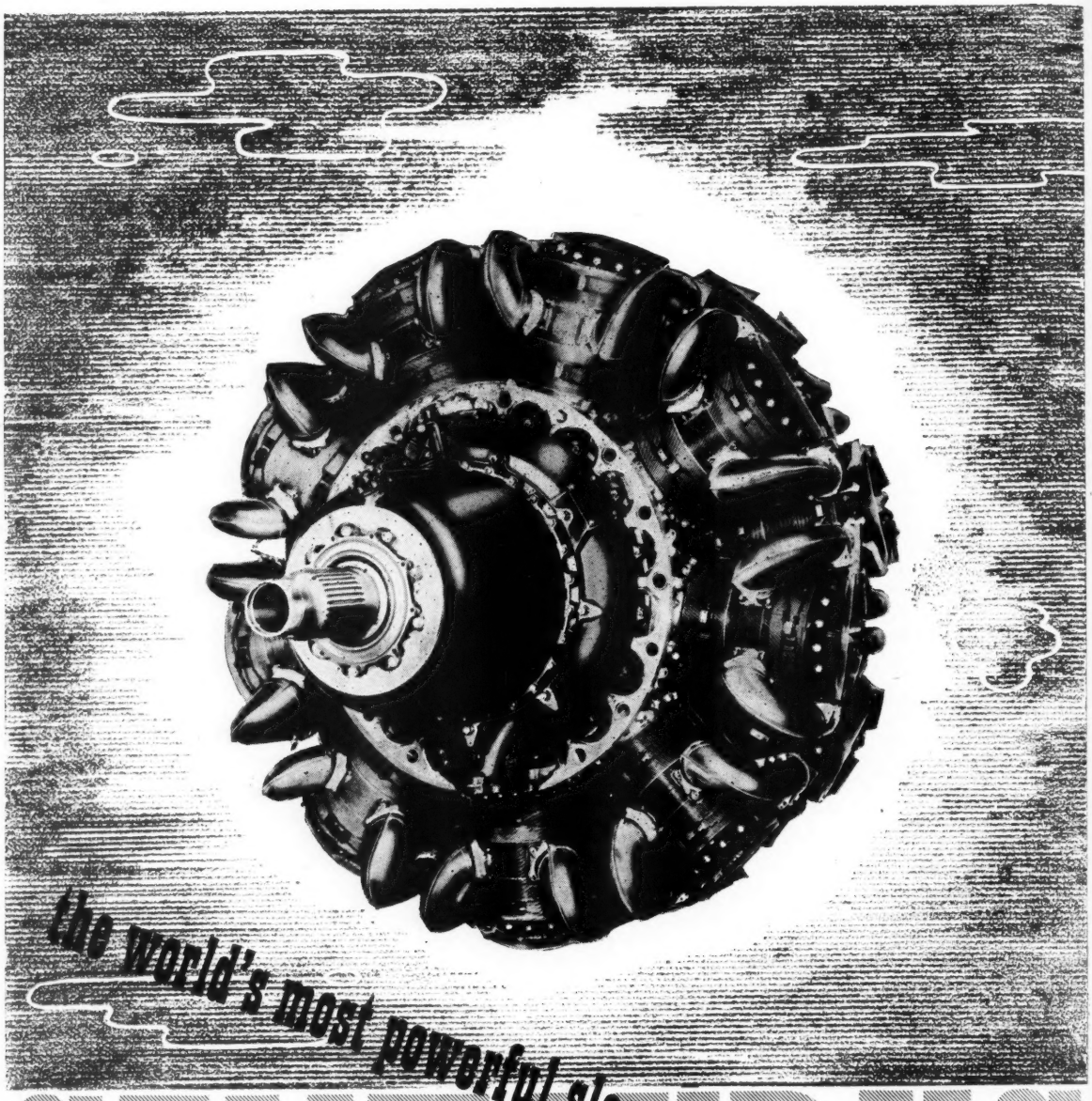
TYRES · WHEELS · BRAKES

SILVOFLEX HOSE UNITS
HYDRAULIC & PNEUMATIC
MECHANISMS · RUBBER PARTS

☆

THE PALMER TYRE LIMITED
HERGA HOUSE, VINCENT SQUARE, LONDON, S.W.1

INDUSTRIAL PALMER X-RAY SERVICE



the world's most powerful sleeve-valve radial engine

CENTAURUS

The new CENTAURUS engine—employing the same broad principles of design as the famous HERCULES—is the most powerful sleeve-valve radial engine in the world. This 18-cylinder sleeve-valve engine develops well over 2,500 B.H.P.—a figure established for production engines of which details can now be released. Powers very considerably in excess of this figure have been achieved both on the test bench and in aircraft still on the secret list. THE BRISTOL AEROPLANE COMPANY LTD.

840E

FLIGHT
and
AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

Editor
C. M. POULSEN

Managing Editor
G. GEOFFREY SMITH, M.B.E.

War Correspondent
JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY:	BIRMINGHAM, 2:	MANCHESTER, 3:	GLASGOW, C.2:
8-10, CORPORATION ST.	GUILDHALL BUILDINGS, NAVIGATION ST.	260, DEANSGATE.	26B, RENFIELD ST.
Telegrams: Autocar, Coventry.	*Telegrams:* Autopress, Birmingham.	*Telegrams:* Iliffe, Manchester.	*Telegrams:* Iliffe, Glasgow.
Telephone: Coventry 5210.	*Telephone:* Midland 2971 (5 lines).	*Telephone:* Blackfriars 4412.	*Telephone:* Central 4857.

SUBSCRIPTION RATES: Home and Abroad: Year, £3 1 0. 6 months, £1 10 6.

Registered at the G.P.O. as a Newspaper.

No. 1913. Vol. XLVIII. August 23rd, 1945 Thursdays, One Shilling.

The Outlook

Air Power's Place in the War

IN an article on another page Major Robertson draws attention to the fact that in the war against Japan the first blow was struck from the air at Pearl Harbour and the last blow came also from the air at Nagasaki. It was in the main a naval war, with carriers playing the foremost part. Command of the seas was the basis on which the Japanese relied in order to make a bid for supremacy in the Pacific and the lands which border that ocean. Command of the seas could not be assured without the elimination of the opposing battle fleets, and so the first blow was intended to hamstring the American fleet, while the second blow abolished the small naval force which Britain could spare at the time for the Far East. The first could only be accomplished by carriers; the second was carried out by shore-based aircraft.

Then, when the immediate limits of aggression had been reached, the Japanese showed an inability to use the means which had served them so well at first. At one and the same time they lost their sea sense and their air sense. At the start of the war they had a strong battle fleet, including numbers of carriers; but they never ventured on a Tsushima. They found themselves defeated in the air, and they accepted their defeat. Ultimately it was the American and British carriers which drove them back from the shores of Australia to the shores of Nippon. The Japanese battle fleet has played no worthy part in the war. The Pacific war was a contest of carriers, helped on many occasions by shore-based aircraft.

There have, of course, been many land campaigns. The one about which people in this country know most is that in Burma. The fighting had to be done by land troops, but their movements depended on air supremacy. The Japanese started with a superior number of aircraft, but Allied fighters gradually drove them out of the skies. It seems incredible that the Japanese should not have fought tooth and nail to retain their position in the air; but they did not seem to realise how vital this was. Their acceptance of Allied air supremacy may be described, not unfairly, as tame. Accordingly air transport and air supply made possible the advance of the British-Indian armies in a way which would have been impossible if the Japanese fighters had fought as hard in the air as their infantrymen did on the ground. That air superiority depends in the first place on fighters is now a commonplace of war; but the use made by the British of their supremacy, namely, the employment of air transport and air supply, was distinctly an innovation.

We do not forget the grand work done by bombers (which, after all, delivered the finishing blow by dropping the atomic bombs), by infantry, by submarines, and by surface warships; but when one comes to sum up the war against Japan, one must admit that the two outstanding causes of the Japanese defeat were the aircraft carrier and the transport aircraft.

Refuelling in the Air

WITH the cessation of hostilities one's thoughts turn naturally to the question of civil aviation. The King's Speech made mention of the fact that Parliament will have laid before it a measure "for the reorganisation of air transport." The phrase does not give any indication of whether or not it is the intention of the new Government to implement, perhaps in modified form, the White Paper of the previous Government, or whether "reorganisation" is a euphemism for nationalisation. Be that as it may, one must welcome

the fact that the subject of air transport is placed among the subjects to be tackled early.

Whatever form our commercial aviation set-up takes, long-distance air routes must necessarily figure largely in the picture, not only those between Europe and North America but also on certain Empire and South Atlantic runs. Long non-stop stages increase the route speed, but unfortunately at the expense of payload. The accepted way of making up this deficiency is to increase the wing loading, but again a price has to be paid for this in the form of enormously long and expensive runways.

Assisted take-offs of various kinds can, of course, help to get a heavily laden aircraft into the air, but even so there is a period of risk which lasts from the moment the throttles are opened until such time as the aircraft has reached a reasonably safe altitude. And even then, the payload of the commercial aircraft will be relatively small if the range is long. There is in existence and definitely proved a method by which not only can the nervous tension of the first few minutes be avoided, but the payload can be greatly increased (estimates indicate that in certain cases it may be doubled). That method is Sir Alan Cobham's refuelling in the air. It is described in considerable detail in this issue.

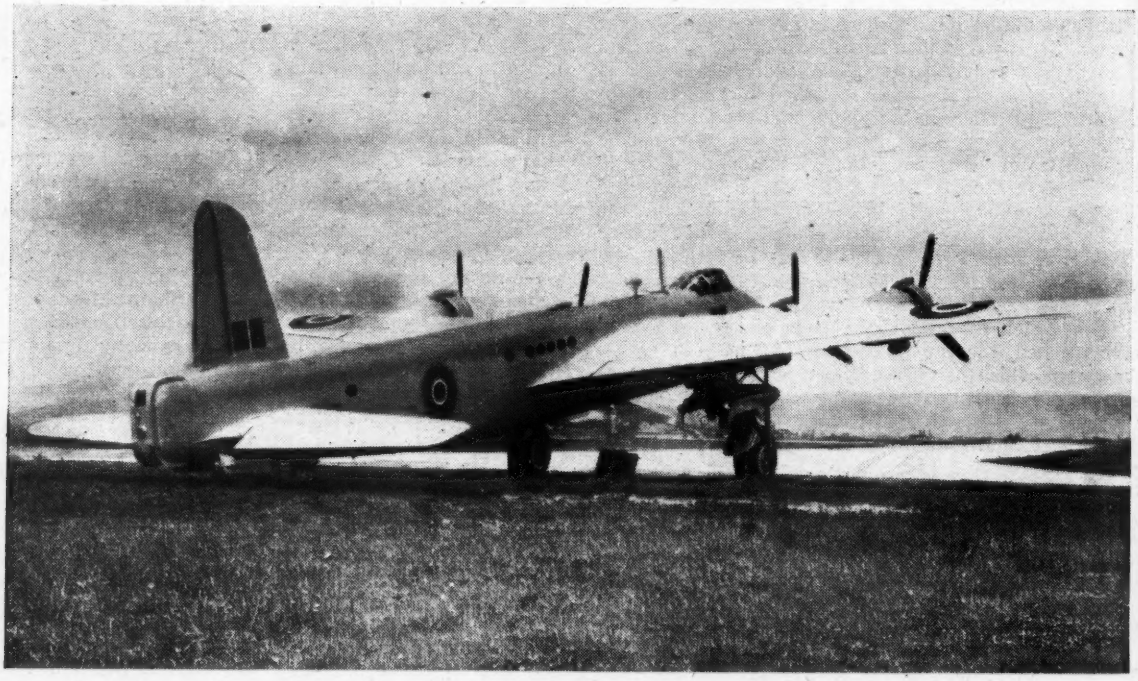
Many of our readers will remember that we have previonsly described this system (in 1939, particularly, we devoted a good deal of space to it). Flight Refuelling, Limited, have, however, not been idle in the interval, and the system has now been so greatly improved in detail, although the basic idea remains the same, that there can be no doubt that the scheme is thoroughly practical and, so far as we are able to judge from personal observation of how it is done, without any risk. Certainly we would rather be in an aircraft that was being refuelled in the air than go through the tension which everyone suffers, consciously or unconsciously, during a very prolonged take-off run followed by a very flat climb. Here we may recall that in the summer of 1939 sixteen flights were made by Short flying boats across the Atlantic, fifteen of them being refuelled in the air from Handley Page Harrows. Every one of those fifteen refuellings was made without a hitch.

There are, of course, several ways in which refuelling in the air can be used. It can, as mentioned, take the place of assisted take-off of an aircraft that would otherwise be too heavily loaded to get off from a runway of reasonable length. But possibly the real application will be in the form of refuelling an aircraft already some 500 miles or so on its way, having taken off from the home base at a reasonable all-up weight and with a good payload, but carrying at the start insufficient fuel to reach its destination. Utilised in that way, refuelling in the air might well mean the difference, on some routes, between the need for a subsidy and the ability to pay as an ordinary commercial undertaking.

We recommend the new Minister for Civil Avation to make a thorough study of what refuelling has to offer. The technical problems can be said to have been solved.

CONTENTS

The Outlook	189
The War Against Japan	191
Here and There	194
Tempest II	196
Landing Rights Wanted	198
Civil Aviation News	199
Payload and Long Range	200
Civil Stirling	205
Radar	208
Mitsubishi S-03 "Tony"	211
Correspondence	212
Service Aviation	213



The 18-passenger, mail and freight, civil conversion of the Short Stirling. Fuselage tail treatment seems to be a little bluff and could well be neatly faired. A survey of the aircraft is published in this issue.

The War Against Japan

By MAJOR F. A. de V. ROBERTSON, V.D.

A Review of the Pacific Struggle, from Pearl Harbour to Nagasaki : Importance of Carriers

NOW that Japan has been well and truly defeated the time has come to examine the part played by air power in this unique and complicated struggle. There has never been a war like it, a war fought over thousands of miles of ocean dotted with innumerable islands, as well as over great stretches of the continent of Asia. Strategy had to be planned on maps of the largest scale, larger even than those required by the Russo-German struggle. The movements of fleets across the Pacific were necessarily slow, and that fact by itself indicated that aircraft would have to play a very prominent part in the fighting.

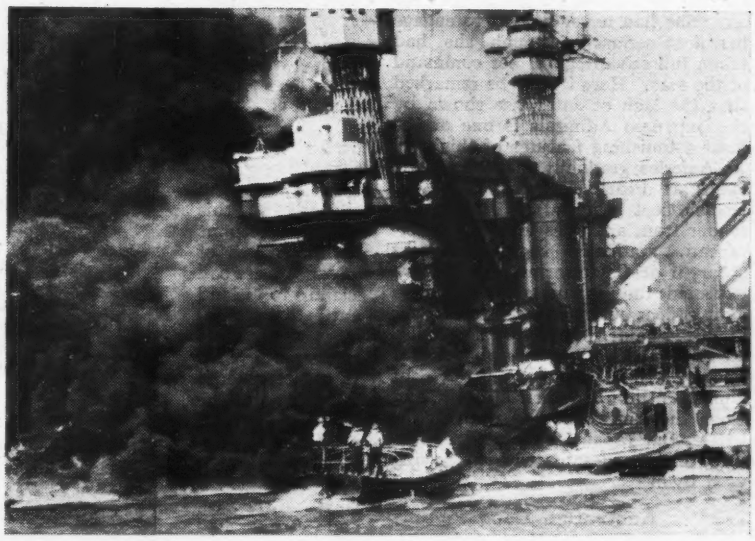
One fact may be noted at the outset of our examination. The first blow against the United States was struck by aircraft at Pearl Harbour, and the last decisive blow was struck by aircraft with atomic bombs against Japan.

In starting our review with Pearl Harbour we are neglecting the war between Japan and China which had been in progress for some years before. All the world is full of admiration for the dogged resistance of the Chinese and of pity for their sufferings. But that war appeared to have reached a stalemate. Japan had failed to subdue the Chinese, and showed no sign of ever being able to do so; while the ill-armed forces of Chiang Kai-shek could hardly be expected to expel the large forces of the invaders from their country. It was Pearl Harbour which was the beginning of the end for the Land of the Rising Sun.

Naval War

That treacherous blow showed the plan which the war must take. It must be primarily a naval war, with aircraft carriers playing the foremost part. Armies of course had to be employed to overrun Indo-China, Burma, and the large islands of the East Indian Archipelago; but armies could never have come into play without the securing by the aggressors of the mastery of the seas. Naturally the first blow was struck at the American fleet, and that blow had to be delivered by carrier-borne aircraft.

The next step was inevitably to prevent interference with Japanese plans by the Royal Navy. The Japanese war lords knew that for the moment the Royal Navy had more on its hands that its attenuated numbers could conveniently tackle. None the less, it was very necessary for them to neutralise the threat of the great naval base of Singapore. The Japanese fleet was then very powerful—how powerful was not known at the time. It ought to have been able to overwhelm whatever naval force the British could spare from the Atlantic and the Mediterranean. But the Japanese were sufficiently clever to prefer the easy way to a possibly difficult one. Their occupation of French Indo-China made it possible for them to seize Singapore from the land side. The British had always reckoned that their alliance with France would guard them from attack on that side.



THE START OF IT ALL : A "flash-back" showing one of the scenes at Pearl Harbour after the treacherous attack. The U.S.S. *West Virginia* burning furiously.

THIS week, for the first time since our September 21st, 1939 issue, this page appears under a different title. On September 28th, 1939, it was headed "The War in the Air," and until last week this and the next page or two have been uninterruptedly devoted to an account of the part played by the air forces of ourselves and our Allies in the wars against Germany, Italy and Japan.

Happily all three have now been fought to a victorious conclusion, and henceforth this and succeeding pages will deal with subjects of technical and civil flying interest, or with the work of the Royal Air Force and Naval Air Service on, we hope, more peaceful pursuits.

We have not relished the task of recording here week in and week out the work of destruction, but it was an essential part of the total war effort and as such had to take its regular place in the journal.—Ed.

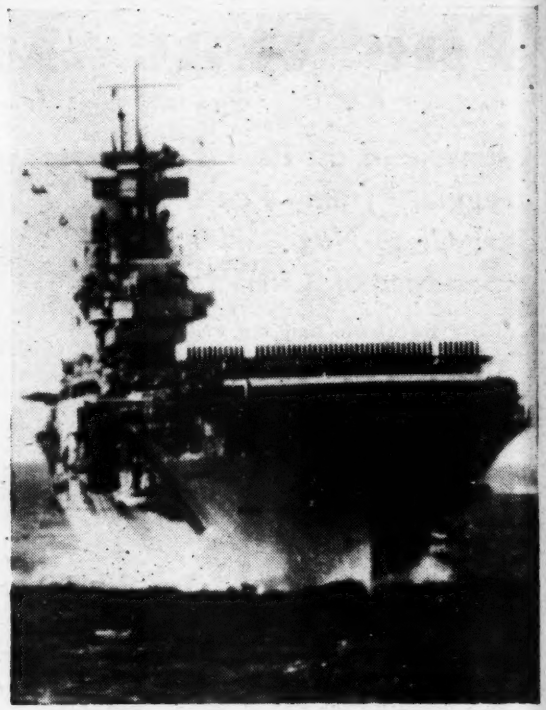
The naval forces which the Admiralty found it could spare for the Far East were pitifully small in numbers, namely, one battleship and one battle cruiser with some of the usual lighter warships. It was a small enough force to challenge the Japanese battle fleet. Still, in the past British warships have often faced great odds with success. But, unfortunately, at the time all the too few British carriers were undergoing repairs, and the little fleet despatched to Singapore was therefore without one indispensable component. Again the Japanese took the easy way, and were quite right to do so. They had air power handy, and their opponents had none. There were a few British fighters in Malaya, but not enough; and the fleet could not, if it was to produce any effect at all, confine its movements to waters within reach of the Malayan airfields. So torpedo-bombers from Indo-China attacked the British ships in great numbers. Their bombs did no irreparable damage, but their torpedoes sent both capital ships to the bottom; and in due course Singapore fell.

Sea and Air

It was a very bad moment for the Allies. Burma was lost, India was threatened, and even Australia was in danger of invasion. Darwin was bombed with distressing loss of life. So far, Japan had played her cards well. She had fought a naval war, but had made more use of aircraft than of warships. Her Army, on which

THE WAR AGAINST JAPAN

Japan has always chiefly prided herself, was used to seize the openings created by success on sea and in the air. She had never needed to engage her fleet seriously, though she had taken full advantage of her command of the seas. Here it may be remarked that the lack of enterprise shown by the Japanese Admirals is one of the most astonishing features of this war. As America gradually made good the losses at Pearl Harbour, while the British fleet, relieved by Italy's surrender from anxieties in the Mediterranean, gradually began to mass strength at Ceylon, one would have expected the Japanese Admirals to fight a fleet action in defence of their ill-gotten gains. This they never did. At the battles of the Coral Sea and Midway they trusted entirely, or almost entirely, to their aircraft, and when the Americans had won the air battle, the Japanese accepted defeat. They lost battleships without having used them.



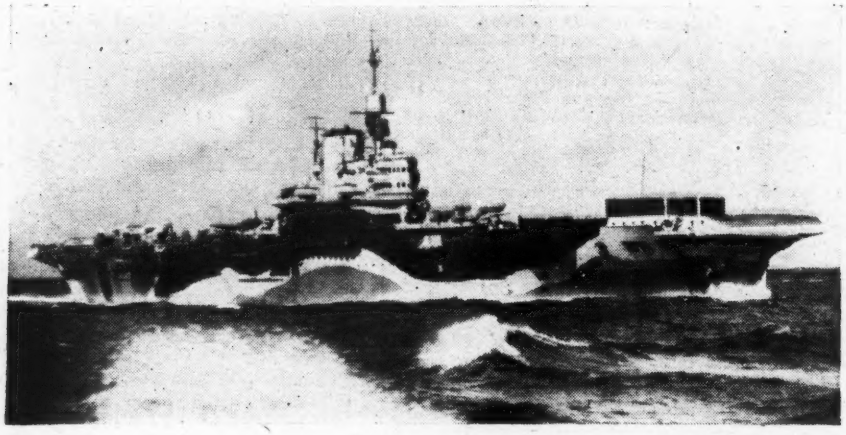
The U.S. aircraft carrier *Yorktown* was damaged in the Coral Sea but was repaired. Built to accommodate 76 aircraft, she has a length of 762ft.

Australian Base

At the darkest hour for the Allies the arrival of General MacArthur in Australia turned the tide. The first strategic necessity was to secure Australia as a base. There were plenty of other reasons for doing everything possible to avert an invasion of Australia; but strategically the necessity to secure a base in the South West Pacific was what mattered. To achieve this it was necessary to prevent the enemy from establishing himself at Port Moresby in New Guinea. At first the resources at Gen. MacArthur's command were very slight; but he gathered together as many bombers as he could raise, and began a campaign of defence by bombing. It succeeded. It was an almost unique episode. Presently Spitfires arrived and took over the defence of Darwin, and in due course the Australians invaded New Guinea, and the backward movement of the Japanese began. The tide had obviously turned.

It is not the purpose of this article to recount all the stages of advance from island to island until the Philippines had been recovered and Japan itself could be attacked. The advance implied a great number of combined operations in which Navy, Air Force, and Army had each to play its due part. The point to note is that once the tide began to turn the Japanese seemed to lose that air sense which had served them so well in the early days of the war. It is true that in the British and Americans they met better men than themselves; but even so the way in which the Japanese threw up the sponge in the air is surprising.

This was particularly the case in Burma. Burma provided in every way an extraordinary campaign. Admiral Lord Louis Mountbatten was obviously made Supreme Commander there because of his experience in combined operations. The right way to tackle the reconquest of Burma was to land a powerful force at Rangoon, capture the port, use it as a supply base, and work up from south to north. But that involved the use of vast quantities of landing craft, and these were needed for Normandy. So the reconquest had to be undertaken from north to south, with every circumstance of geography and climate telling against the British and Indian forces. The advance was only made possible by the use of air transport on a scale never attempted before and never even imagined. Obviously air supply would be impossible if Japanese fighters were able to interfere with it. At the start of the British-Indian advance the Japanese Air Force in Burma was numerically stronger than that of the Allies, and so the first act in the drama lay with our fighters. Spitfires and Thunderbolts had arrived, and they speedily drove the Japanese out of the skies. Despite the readiness of most Japanese fighting men to die, the Jap who is beaten by a stronger opponent is apt to lose his nerve completely, and the enemy pilots soon began to show a healthy terror of the Spitfire. They were soon withdrawn from Burma to Siam, and our supply aircraft, all unarmed as they were, found themselves able to fly where and when they wished. The fighters could then turn their attention to giving close support to the infantry, while the bombers cut the railway from Bangkok, and the flying boats (now organised as the Indian



Among the British carriers which saw service in the Pacific was H.M.S. *Formidable*, of 23,000 tons.

THE END OF IT ALL. The smoke column rising above Nagasaki three minutes after the atomic bomb had exploded on August 9th.

Ocean Air Force) proceeded to sink shipping wholesale in the Gulf of Siam.

The weather proved a worse enemy than the Japanese; but from the first Admiral Mountbatten gave orders to fight on and fly on through the monsoon. This was done, and it proved a horrid surprise to the enemy. One great risk was taken, when the transport aircraft had pretty well to double their flying hours; but the aircrews rose nobly to the occasion and surpassed their previous efforts. It was a gamble which came off.

Meanwhile in the ring rapidly closing in on the Japanese home islands, the enemy also gave up the dispute for air superiority. They confined their efforts to despatching suicide bombers against the Allied fleets. These did some damage but lost very heavily. Tokyo announced that the rest of the Air Force was being reserved to meet the expected invasion. As a result thousands of aircraft were destroyed on the ground by the fighters and bombers from the carriers in the 3rd Fleet of Admiral Halsey.

Finally came the atomic bombs dropped from the air, and then Japan expressed willingness to surrender on terms.

THE WAR AGAINST JAPAN

Outstanding Successes

While everyone and every weapon has played its part against Japan, the outstanding feature of this war has been the success of air supply and of the aircraft carrier. In the Mediterranean the British learnt that this type of warship, when well supplied with protective fighters, is not nearly so vulnerable to air attack as had been feared. Actually the submarine proved a worse menace. In the Pacific both Americans and Japanese have lost carriers; but on the other hand carriers have won naval actions on their own. The idea that carrier-borne machines must be inferior to land-based ones has been largely discounted. Certainly the heaviest bombers cannot yet take off from the flight deck of a ship—but then the advent of the atomic bomb raises the question whether very heavy bombers will be needed in the future. The lighter classes of carrier-borne machine, though they must be equipped with hooks and have folding wings, do not seem to be much handicapped by the extra weight in doing their work. The Pacific war had to be fought mainly by carriers, and they have done all that was asked of them.

POST SCRIPTUM

THE Allies conceded Japan's stipulation that the authority of the Emperor should remain. It seemed the easiest way of ensuring that all Japanese forces should immediately lay down their arms. Nevertheless, when some Fortresses flew over Japan a few days later they were attacked by Japanese fighters, and blood was shed on both sides. The question remains: was this treachery or were the Emperor's orders of less effect than had been anticipated?

* * *

Likewise the Japanese forces in Manchuria continued to resist the Russians for several days after the order to cease fire had been issued from Tokyo. Again we wonder whether communications had broken down or whether the local commanders had disregarded the orders of the Emperor.

* * *

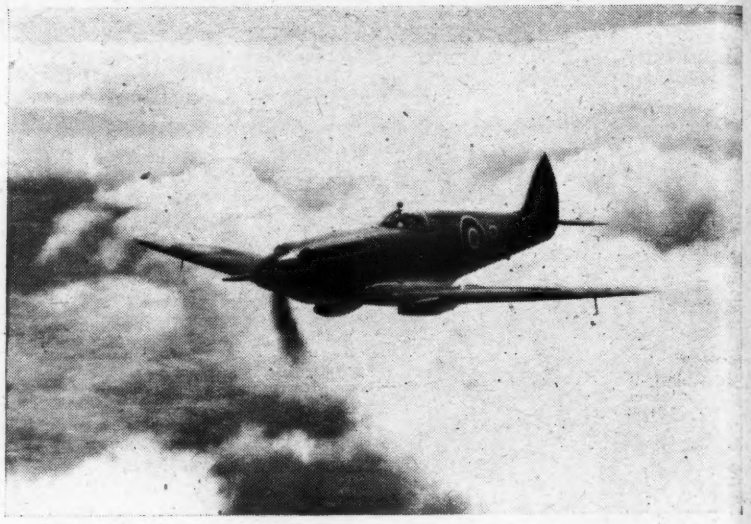
Gen. MacArthur was appointed Supreme Commander of the Allies in dealing with the surrender of Japan. He ordered some official representatives, bearing with them the written authority of the Emperor, to fly to Manila to settle detailed terms. They were to start on a certain day, from named airfields, in specified types of aircraft. Actually they did not set off till a couple of days later, and Tokyo then informed the Supreme Commander that they had left from other airfields and in different types of aircraft from those laid down. That was typically Japanese behaviour.

* * *

The American Fleet lying off Japan was approached by a number of Japanese bombers, apparently with hostile intentions. The fleet shot down 16 of them.

However, after all these incidents, it seems that the details of the Japanese surrender are now being arranged in a normal way.

HERE AND THERE



SLEEK SPEED : This picture of a Seafire XV would be difficult to tell from one of a Spitfire XIV, since they are basically the same Giffon-powered type, except for the former's folding wings and special naval equipment.

For Fighter Command

AIR VICE-MARSHAL STANLEY F. VINCENT, who has commanded a group in South East Asia Air Command since February, 1944, has now been appointed Senior Staff Officer, Fighter Command.

A £500 Two-Seater

NEW YORK radio (quoted by Reuter) last week announced that a two-seater private-owner's aircraft with a top speed of 135 m.p.h., a landing speed of 40 m.p.h. and a range of 400 miles is now in production at the Jarvis Co.'s factory at Glandale, Ohio.

Beyond saying that it is of the pusher type, no further details of this attractively priced newcomer were given.

Air/Sea Rescues

THE grand work of the Air/Sea Rescue Service, already widely appreciated, is emphasised by statistics recently released for publication.

During the war against Germany, 5,721 British and American airmen were rescued around Britain. Of this total 1,998 were Americans.

Overseas A.S.R. units saved at least 3,200 aircrew members, and in seas other than around Britain, the service rescued 4,665 soldiers, sailors and civilians.

One of the busiest periods was in July, 1943.

Speedier "Demob."

UNDER the plans for speeding up the release of R.A.F. and W.A.A.F. personnel recently announced by the Air Ministry, age and service groups previously announced for demobilisation by the end of September are being released this month with the exception of some W.A.A.F. officers. Some additional groups are also to be released during September instead of later.

Cold Water

WHEN speaking at a U.S. Air Force dinner a few nights ago, Air Marshal Colyer, who, by the way, is the British Air Member of the Combined Chiefs of Staff Committee as well as head of the R.A.F. Delegation in Washington, told his audience that Germany was "months ahead" of Britain and the U.S. in the development of jet-propelled aircraft when she was defeated. This, he said, emphasised that superior production and material resources would no longer be enough in this scientific age—"The race is to the clever rather than the strong."

One imagines that an American audience, encouraged by its native Press and publicity experts to believe that it is always first and best at everything, must have been somewhat shaken by this statement—even after a good dinner.

Dead Heat?

IN recording a flight from Staten, Ohio, to La Guardia Airfield, New York, by a jet-propelled Lockheed P-80 Shooting Star at an average speed of 570 m.p.h., a report radioed from Ottawa (quoted by Reuter) says that this aircraft thus "established itself as the fastest plane in the world."

It is pertinent to point out that the top speed of the British de Havilland Vampire, fitted with the de Havilland Goblin jet-propulsion unit, has not yet been officially divulged, but if the reader now turns to the de Havilland advertisement in last week's *Flight* he may draw certain conclusions from the wording of the officially sanctioned text.

ASTRAL ALACRITY : A Lockheed P-80 Shooting Star seen above some of its native mountains. Span is 38ft. 10½in., length 34ft. 6in., and empty weight about 14,000lb. (See adjoining paragraph.)

Pageant of the R.A.F.

NEARLY 2,000 men and women of the R.A.F., the W.A.A.F., and Dominion Air Forces are to take part in a pageant of the R.A.F. which is to be staged in the Albert Hall, London, on September 19th and 20th. The Air Forces of the countries of Europe which were occupied by the Germans will also be represented.

The pageant, which opens with the struggles of the Wright brothers and other early pioneers, covers the development of the R.F.C. and R.A.F. through two wars up to the present day, and famous pilots of both wars will take part in the performance. R.A.F. bands and a choir of 200 will provide the music.

The R.A.F. Association and the R.A.F. Benevolent Fund will benefit

HERE AND THERE

from the pageant, the production costs of which are to be defrayed by *The Daily Telegraph*.

Blind Chance

SEVERAL of the 230 balloon bombs which reached America from Japan fell near an atom-bomb plant at Hanford, Washington, it was reported last week from Seattle.

The bombs landed in various places in Western North America from Alaska to Mexico, some of them getting as far east as Michigan, but except for one which exploded at Lake View, Oregon, and killed six people, they did very little damage—and no good at all to the Japs.

Ceremony in Belfast

FIVE members of the Northern Ireland Cabinet and five Generals—four from the U.S. Army and one from the British—were present at a ceremony recently in the American Red Cross Club, Belfast, when the key of Langford Lodge, the last big air base in Northern Ireland, was handed over to the R.A.F.

Maj. Gen. Walter M. Robertson, commanding the 15th Corps, gave the key to Air Comdre A. R. Churchman, D.F.C., A.O.C. Northern Ireland, who said that the ceremony represented an open sesame to a new and lasting era of co-operation.

Sir Basil Brooke, Prime Minister of Northern Ireland, said that they took great pride in the number of U.S. Presidents of Ulster stock.

Unusal Honour

AN honorary pilot's badge has been awarded to Mr. J. Vivian Holman, manager of the Sperry Gyroscope Co.'s aeronautical department, by the C.-in-C. of the Polish Air Force, "in commemoration of valuable co-operation rendered to the Polish Air Force." Although the badge has been awarded to a number of serving officers, this is understood to be only the second time it has been given to an ex-officer of the R.A.F.

UNHAPPY LANDING: The waters of Chesapeake Bay close over the sinking wreckage of the *Hawaii Mars*, which recently "crash-landed" on its test flight, but fortunately without any loss of life.

News in Brief

MARSHAL of the Royal Air Force Sir Charles Portal, Chief of Air Staff since 1940, is made a Baron in the recently published Resignation Honours List of those who assisted Mr. Churchill during his office as Prime Minister.

* * *

Mr. A. S. Drakeford, Australian Air Minister, announced the cessation of recruiting for the Royal Australian Air Force and the Australian W.A.A.F. No decision had yet been taken on the future strength of the R.A.A.F. "It will have to be related to the general defence set-up for Australia," he said.

* * *

A donation of £10,000 has been made to the R.A.F. Benevolent Fund by Major H. P. Holt, M.C., a former High Sheriff of Wiltshire, in memory of his nephew, F/O. P. G. Holt, of the R.C.A.F., who was killed in action in 1943. Major Holt has also made two donations of £10,000 each to the Royal Armoured Corps Charities Trust, one in memory of his son, Lt. G. H. P. Holt, of the R.A.C., who was killed in action in Italy last November whilst serving with the 9th Lancers, and the other in memory of his old comrades of the Royal Tank Corps in the last war.

* * *

The R.A.F. Benevolent Fund's biggest windfall must surely be the cheque for £250,000 resulting from a competitive subscription in South Africa which raised about £400,000 for the R.A.F. and the S.A.A.F. Benevolent Funds. Mrs. Jean Hamilton, nominated by the winning group in this Union-wide effort, recently flew from Johannesburg to England to present the cheque to the Duchess of Kent.

* * *

A branch of the Royal Air Forces' Association is to be formed in Eire. Membership will be open to all men and women of the British, Dominion and Colonial Air Forces. Application for membership should be made to the Hon. Sec., 34, Corrig Avenue, Dun Laoghaire, Co. Dublin.

* * *

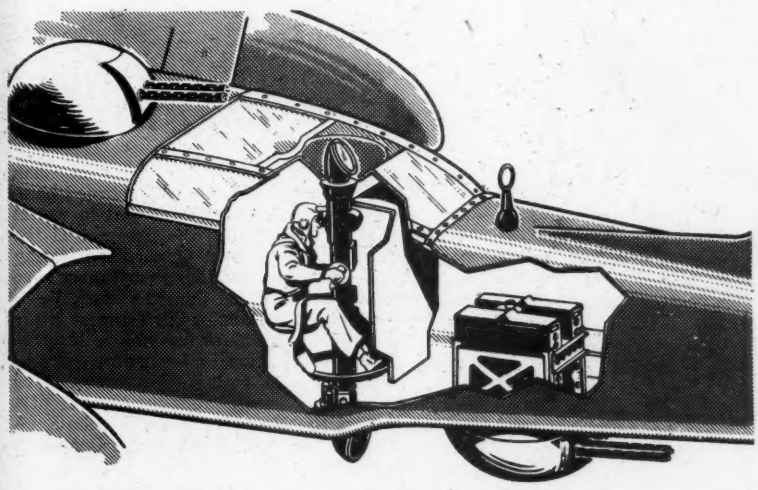
Sir James Chadwick, chief scientific advisor to the British members of the combined Allied policy committee in Washington, said last week that any nation with reasonable industrial facilities could start now and produce an atomic bomb in five years' time without any help from Britain or the U.S. It could be done, he said, by "just knowing that it is possible."

* * *

Mr. James D. Pearson, chief technical services engineer of Rolls-Royce, Ltd., has gone to Montreal to establish a technical and engineering office there. The local office will provide service representation for the R.C.A.F. Mr. Pearson, who was accompanied by his wife and two children, said he expected to remain in Montreal for a year.

* * *

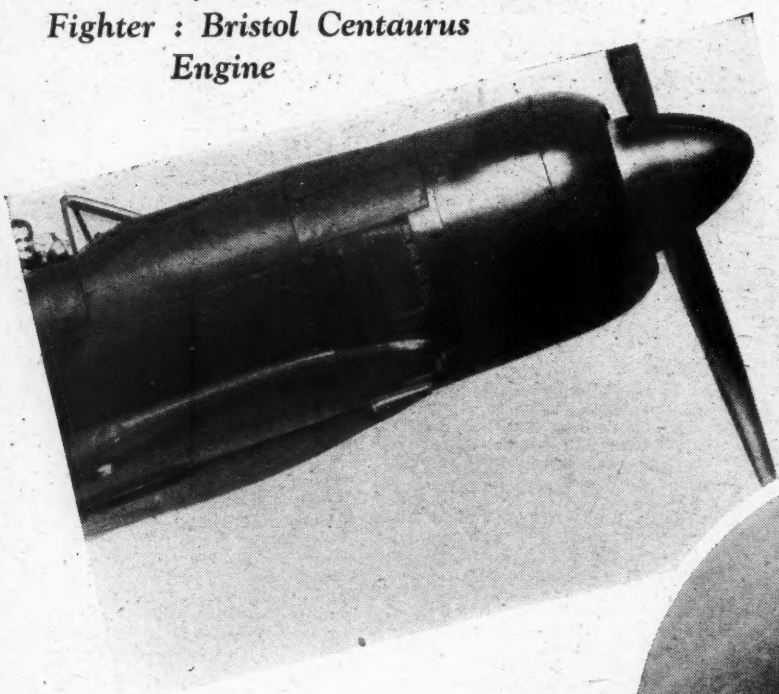
Following on the announcement of the relinquishment by Col. Devereux of his position as chairman and managing director of High Duty Alloys, Ltd., Mr. Spence Sanders has now relinquished his position as deputy managing director. Mr. Sanders will retain his seat on the board of International Alloys, Ltd., and will be associated with Col. Devereux in future plans to be announced shortly.

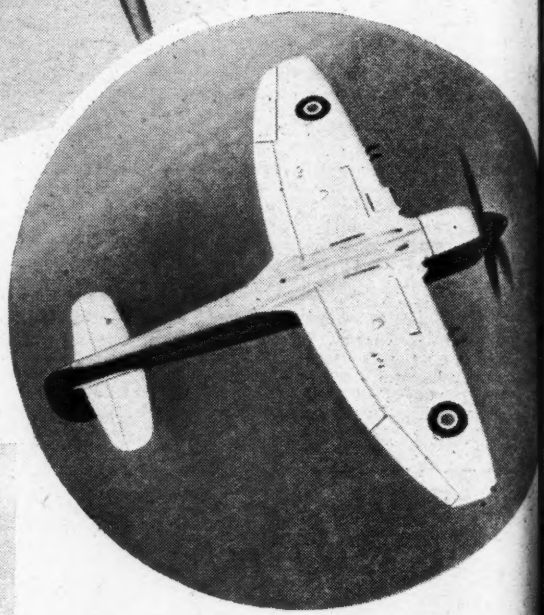


ONE-MAN JOB: This cut-away sketch shows how one gunner, by means of a double periscope sight, remotely controls dorsal and ventral two-gun turrets on the Douglas A-26 Invader. His seat traverses 360 degrees.

Hawker Tempest II

Most Powerful British Single-engined Fighter : Bristol Centaurus Engine



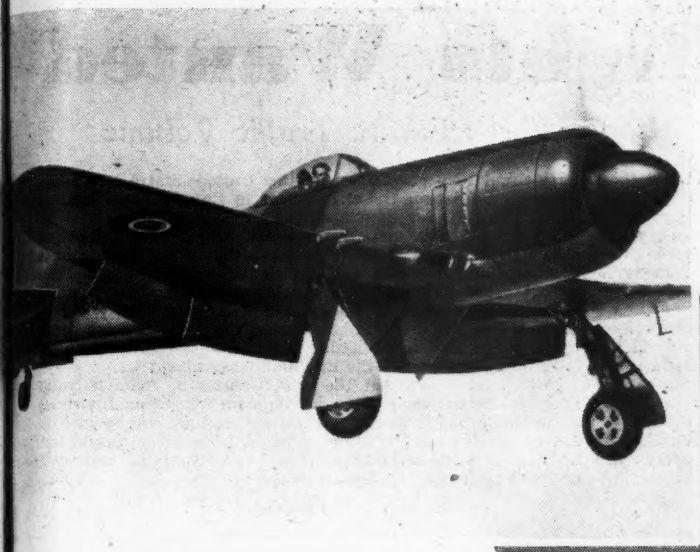


SOMETIMES it happens that the first of a series of aircraft is not the type bearing the lowest works number, a fact which may seem puzzling since it is natural to expect the Mark I to be followed by the Mark II, and so forth. This departure may be due to several causes. Operational requirements may change while a type is being evolved, causing particular stress to be laid on features or equipment not thought urgent while the original design was being planned. Or the power plant for which the first machine was designed may not be available in sufficient numbers for one reason or another. Furthermore, there may be gaps in the numbers, possibly because one or more projects were discarded or deferred as being less promising, or of less urgency.

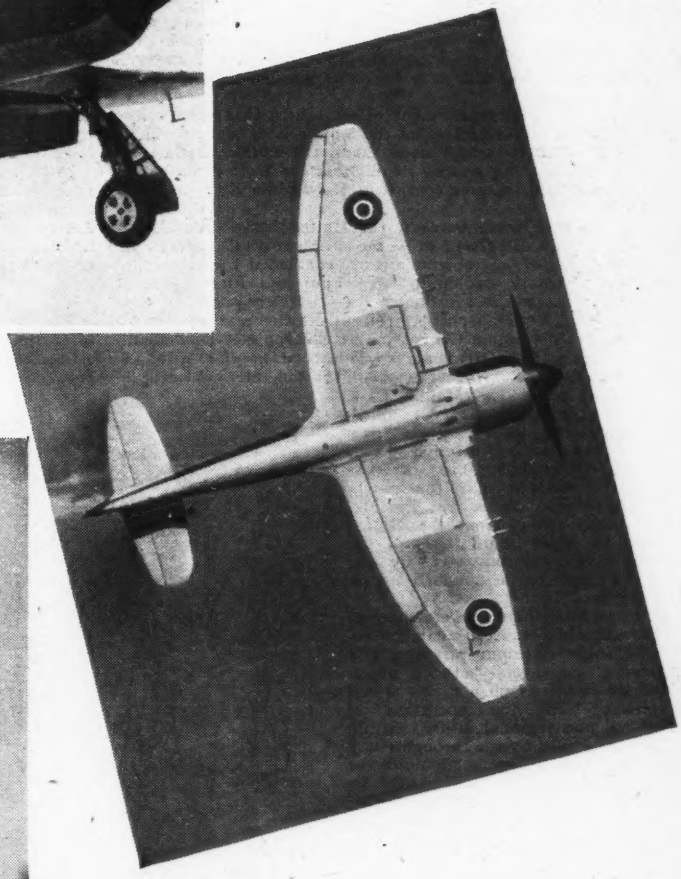
A case in point is the Hawker Tempest series. The first to be released for a full detailed description was the Mark V (*Flight*, March 1st, 1945) with Napier Sabre engine of more than 2,200 h.p. The Tempest Mark II illustrated herewith has a Bristol Centaurus of "well in excess of 2,500 h.p." This makes the Tempest II the most powerful single-engined fighter, and it may be assumed as a logical corollary that it must have an even better performance than the Mark V.

The constructional details of the Tempest II are similar to those of the Mark V, viz., a fuselage having girder construction in front and stressed-skin at the back, with stressed-skin wings. The Tempest V is very "clean," but the absence of a radiator makes the Mark II even more sleek. A somewhat remarkable thing is that the Centaurus radial engine does not look very large in the Tempest, due to the way its cowling fairs into the fuselage form. It might be added that no space has been wasted and the cowling is as close as that of the Fw 190.

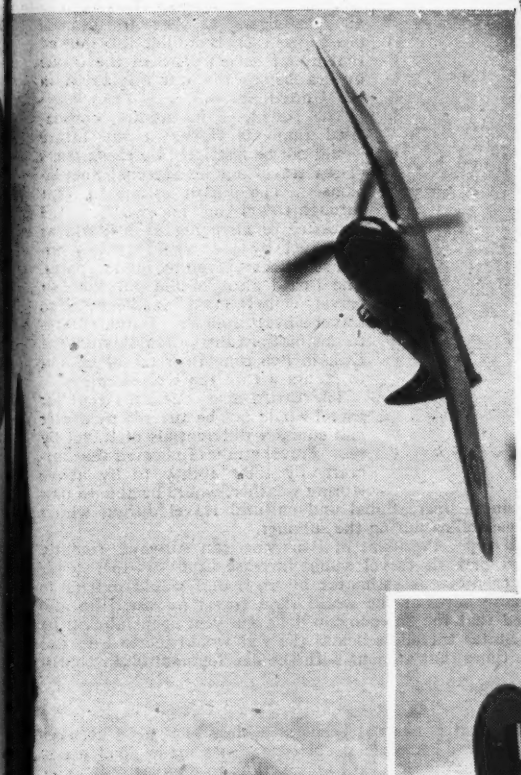
These photographs, taken by Mr. John Yoxall, give a very excellent idea of the manœuvrability of the Hawker Tempest II in the hands of Mr. Humble. They show well the lines of the machine from many points of view, and bring out the close similarity between it and the Tempest V. The neat and close cowling around the Bristol Centaurus radial engine gives an appearance of low drag.

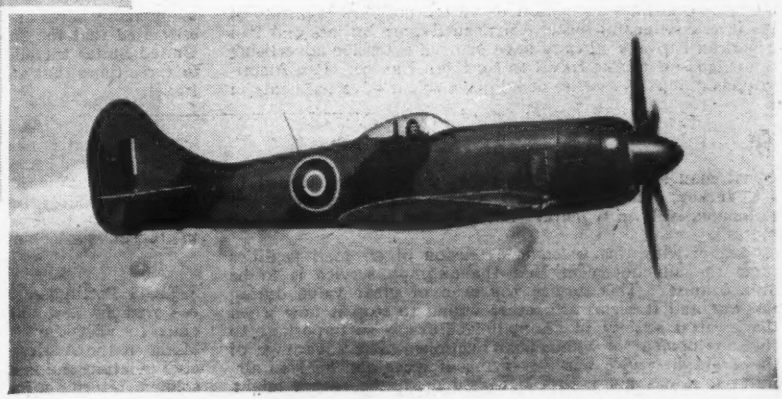


With flaps and undercarriage down the Tempest II does not look quite so sleek.



"Vertical bank" is a term often based upon faulty observation. In the picture on the left there can be no argument that the Tempest was well past the vertical as it swung behind the photographic machine.





In the upper left-hand picture on the opposite page, Mr. W. Humble appears pleased with the formating of the photographic machine. It must certainly have been close. In the other two pictures he gave the photographer some good views of both upper and underside of the machine.

CIVIL AVIATION

Landing Rights Wanted

American Interest in the Middle East : Future Traffic Volume

PLANS of United States airlines to fly to Europe and the Middle East on the routes recently approved by the Civil Aeronautics Board will require landing rights in 33 countries, including the nations of the Middle East. The proposed inter-continental routes extending through the Middle East to India could not be operated into and through the foreign countries involved until those countries granted the necessary landing rights.

Interest in the establishment of air routes that eventually will circle the world centres on the Middle East region, which has been called the aerial crossroad of the world. Estimates have been heavy for tourist travel from the United States to the historic and cultural centres of the Middle East in post-war years.

The northern route between the United States and Scandinavia appears at present to be the closest realisation through bilateral transport agreements already concluded with Iceland, Sweden, Denmark (including Greenland) and Eire. These agreements include recognition of the "five freedoms" of the International Air Transport Agreement drawn up at the International Civil Aviation Convention at Chicago last December.

The U.S. State Department, it was learned, hopes to arrange for landing rights on other segments of the inter-continental routes, including the Middle East, through the application of multilateral agreements covering the "freedoms of the air" and through specific bilateral agreements. The State Department believes that the potentialities of post-war air travel, including tourist travel from the United States to many more parts of the world than were convenient by sea, are too great to be bounded by restrictions.

On the other hand, several nations have expressed concern that the so-called Fifth Freedom privilege (for carrying passengers between intermediate countries on a route) would interfere with the operation of national and regional airlines within the areas served by the through trunk airlines. This danger, while no doubt real, is somewhat mitigated by Article Three of the International Air Transport Agreement covering the Five Freedoms which specifically provides that:—

"Each contracting state undertakes that in the establishment and operation of through services due consideration shall be given to the interests of their contracting states so as not to interfere unduly with their regional services or to hamper the development of their through services." It might be, of course, very difficult to determine when a conflict arises, what undue interference exactly means.

The two airlines authorised to fly the northern segments of the inter-continental route, American Export Airlines and Pan American Airways, already have planned extensive advertising campaigns for tourist travel to Northern Europe. Pan American has published a series of full-page colour advertisements in large-circulation magazines in the United States, outlining plans for tourist air travel to points in Europe where landing rights already have been arranged.

COLLINGRIDGE

THIS IS TAKING THE COMFORT OF THE PASSENGERS TOO FAR

Transcontinental and Western Air, which was authorised with Pan American to fly to points in the Middle East, also is planning an extensive advertising campaign to stimulate tourist air travel. But advertising portraying the historic and cultural regions of the Middle East, particularly Cairo, which was designated as a key stop on the TWA through route to India, cannot be circulated until landing rights in Egypt have been approved by the Egyptian Government.

It is pointed out that the establishment of through trunk lines would encourage the development of regional airlines along the through routes. The through airlines will operate on infrequent schedules at inconvenient times at some places, but will require a few regional passengers as a "marginal reserve," to make their operations economical.

Forecast

The Civil Aeronautics Board, in designating the proposed inter-continental routes after several years of intensive study, estimated that 200,000 passengers a year would travel by air between the United States and the European Continent in the near post-war years. This figure was based on estimates by the various airlines, ranging from 194,000 air passengers a year to 550,000 passengers. CAB studies also showed that about 80 per cent. of the travel by sea before the war originated in the United States.

The Board, in its studies, emphasised that air travel in the future would not be restricted by the barriers of sea travel nor by seasonal fluctuations. The Board estimated that through-travel by air without the necessity of changing at seaports as in travel by sea would greatly increase direct travel to inland ports. The Board also pointed out that air travel would make it possible to travel direct from the United States to destinations in the Middle and Far East in less time than travel by rail to points within the United States.

The Board also concluded that air travel would not be affected by winter and summer differentials of travel by sea. Travel studies indicated that aircraft, by their ability to fly above stormy weather, would be able to provide business, recreational and cultural travel during winter months as well as during the summer.

Juan Trippe, President of Pan American Airways, recently estimated that air travel would increase from 500 to 600 per cent. over previous estimates by 1950 and would extend to many more parts of the world than travel by sea. He also estimated that the 800,000,000 dollars a year spent abroad by United States travellers before the war would increase to two or three times that amount with the development of air tourist travel.

AIR MAIL

AIR mail services from this country are now extended to Turkey. Mail for Bulgaria, Greece (including Crete) and Roumania is flown to Turkey and thence forwarded by surface routes.

Parallel with this welcome extension of air mail facilities came the announcement that the airgraph service is to be discontinued. This service has been of great value during the war and it seems altogether wrong to stop it now when the greatest variety of air mail facilities is so important to the development of commercial relations. The advantage of the airgraph service was the saving of space and load on aircraft; if it has not been too widely used, the reason might have been that it has not been too widely known. But, even during the war commercial correspondents made good use of the service, and with a Post Office effort to popularise it more, it could certainly be of wider appeal. Surely the expected volume in air mail correspondence should justify the economy in transmission achieved by the airgraph service.

HUSH-HUSH VISIT

HIGH Portuguese air officials accompanied by the U.S. Air Attaché flew out over the Atlantic in an American aircraft to visit the "hush-hush" American airfield of Santa Maria in the Azores, which is destined to play a big part in civil aviation and is already familiar to thousands of American soldiers returning from the war theatres.

CIVIL AVIATION NEWS

CHANNEL ISLANDS SERVICE

GUERNSEY AIRWAYS have carried over 800 passengers and 14 tons of freight since they started operating after an interval of five years. By next month the company proposes to re-establish their services to Southampton, and as soon as aircraft become available they propose to use larger and faster aircraft.

At present it speaks well for the organisation of Guernsey Airways that they have achieved their traffic results with only two new De Havilland Dominies released from the R.A.F.

SPRINGBOK SERVICE

THE long-expected trunk passenger service between the United Kingdom and South Africa is to start this year and will link up at Cairo with other Commonwealth and Empire services. Announcing this, Col. Leverton, acting manager of the South African Airways, said that the service would be operated jointly by the Union Government and the B.O.A.C., each of which will control its own sector.

In the initial stage, during which Avro Yorks will be used, the journey from U.K. to South Africa will take 70 hours, and later when Tudors will be available, 50 hours. Until such time as the Union Government will be able to purchase Tudors they will charter Yorks from the British Government.

A NEW POLICY?

RUMOUR wants it that the Government intends to modify substantially the plan for the organisation of British air transport services embodied in the White Paper. While it is unlikely that such legislation would be put before the House very soon, it is said that the Government plans to transfer the entire future network into one publicly controlled body.

The organisation of Commonwealth and Empire services would, however, remain on the lines agreed at the recent Commonwealth Conference in London and would be operated on the basis of "parallel partnership."

SEEDING BY AIR

DR. LYTLE S. ADAMS, of San Diego, U.S., designer of a mail pick-up, has developed a method for the quick and inexpensive planting of large acreages.

He claims he can plant 20,000 acres an hour with his newly designed aircraft seed-pellet disseminator. Rice has been successfully sown from aircraft, but most other attempts at aerial seeding have failed because the seeds were too light and, if not blown away, were easily destroyed by animals or weather.

Dr. Adams' experiments showed that a clay or mud coating would provide weight and protection, yet would dissolve easily in most soil to release the seed after it had penetrated the ground.

In seeding by aircraft Dr. Adams uses another of his inventions, the seed disseminator, a kind of rimless wheel with hollow spokes. It provides a controlled, wide band of dissemination with as many seeds per acre as desired. The weight of the pellet plus the altitude of the 'plane determines penetration.

Because of the speed of sowing, the low man-power required, and the certainty of germination, it is estimated that costs should be less than half those of planting by ordinary means.

MONTREAL MEETING

HIGH hopes of making aircraft an instrument of benefit to mankind in the years ahead were expressed in Montreal by representatives of 17 nations at the first meeting of the interim council of the Provisional Civil Aviation organisation which the 54-nation Air Conference at Chicago last December agreed to set up. This is the first of a series of international bodies designed to promote world peace and prosperity.

Mr. C. D. Howe, Canadian Minister of Reconstruction, with jurisdiction of civil aviation, in his inaugural speech, said that Canada intended to play a leading part in world transport by air. "We are only awaiting peacetime economy to expand our operations," he declared.

Air Chief Marshal Sir Frederick Bowhill, British representative, told the meeting that air traffic would play an ever-increasing part in international relations, adding that "progress in civil aviation must be made on the highest level with lofty ideals, but practical ideas without fear or favour."

I.A.T.A. CONFERENCE

A CONFERENCE to liquidate formally the I.A.T.A. will be held in London at Airways House on September 17th.

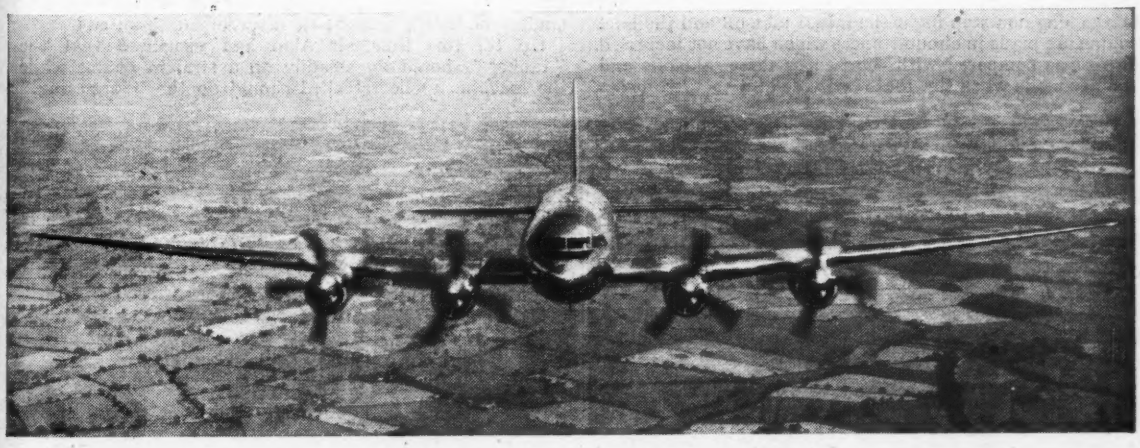
Following the formation of a new International Air Transport Association early this year, it was decided that the original I.A.T.A., established in 1919 by the initiative of Mr. George Holt Thomas and Sir Sefton Brancker, should cease to operate. To maintain some continuity and to give expression to the fruitful work of I.A.T.A., however, the new organisation will retain the initials.

It was originally planned to hold the final meeting of the "old" I.A.T.A. at The Hague, but the ultimate decision was in favour of London. The forthcoming meeting at which the new organisation will take over thus marks the conclusion of a long chapter of co-operation of air transport operators, in which I.A.T.A. was instrumental, and the beginning of a new one which it is hoped will be no less efficient.

TO MADRID

A WEEKLY cargo and passenger service from Paris to Madrid is being operated by the U.S. Air Force Transport Command.

It is expected that the service will be increased to at least three times a week.



FIRST OF THE TUDORS : The Avro XX (Tudor I) which has successfully completed flight tests will be in operation by next spring. It will be used on the North Atlantic route until the Brabazon I is ready. Flight tests have shown that the Tudor's estimated max. speed (346 m.p.h.) and payload may be exceeded.

Payload and Long Range

How Refuelling in the Air Can Help: Technical Problems Solved: Full Details of Sir Alan Cobham's Latest Developments: Method now completely Safe and Reliable.

By THE EDITOR

ALTHOUGH it is now twelve years since the first actual experiments with transferring fuel from one aircraft to another in flight were made in this country, relatively few know—or remember—the early experiments, still fewer realise the advanced stage of development which has now been reached. The origin was little more than a "circus stunt," but the modern application may be capable of doubling the pay load on routes where long non-stop stages must be flown for geographical reasons (the North Atlantic, for example) or where other considerations make long stages desirable.

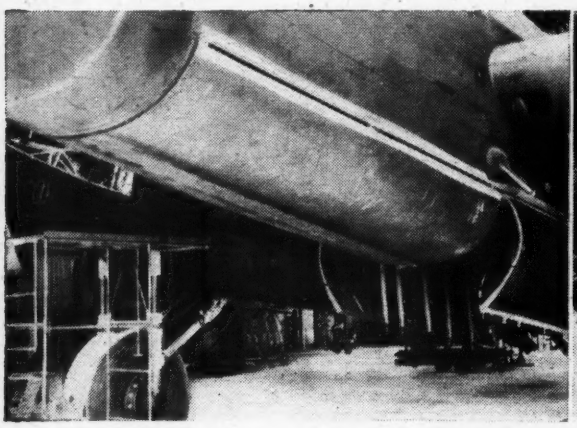
The cessation of hostilities will see an immediate increase in all commercial flying, and among the routes on which there will, within the next few months, be feverish activity in an endeavour to be among the first to become established is that spanning the North Atlantic between Europe and the North American continent.

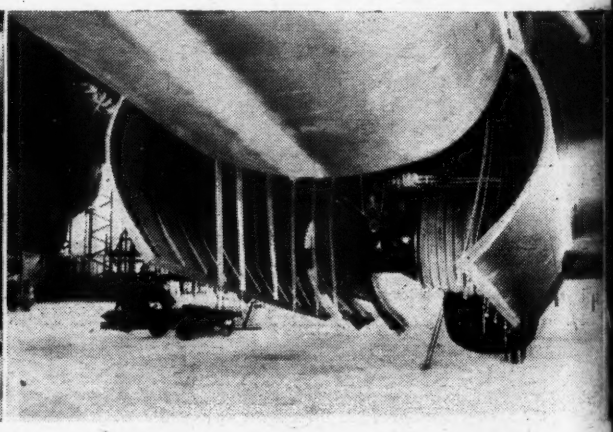
That these routes can be operated with normal aircraft carrying relatively small payloads has been amply demonstrated during the war, but to carry fare-paying passengers at reasonable fares is quite another matter. The two routes—the southern via the Azores and Bermuda and the northern via Newfoundland—are practicable, but direct flights between England and New York, for instance, would save a great deal of time. Moreover, it is generally true to say that the greatest risk of flying occurs during take-off and landing, and thus by reducing the number of these the safety of the whole flight should be increased. This statement needs the qualification that it presupposes that for the long non-stop flight the initial take-off and the final landing are made in circumstances which have not increased the risk as compared with the two or three take-offs and landings made when the route is divided into stages. From recent study of Sir Alan Cobham's up-to-date refuelling tests it would certainly appear that such can now be said to be the case.

Inspiration from a "Stunt."

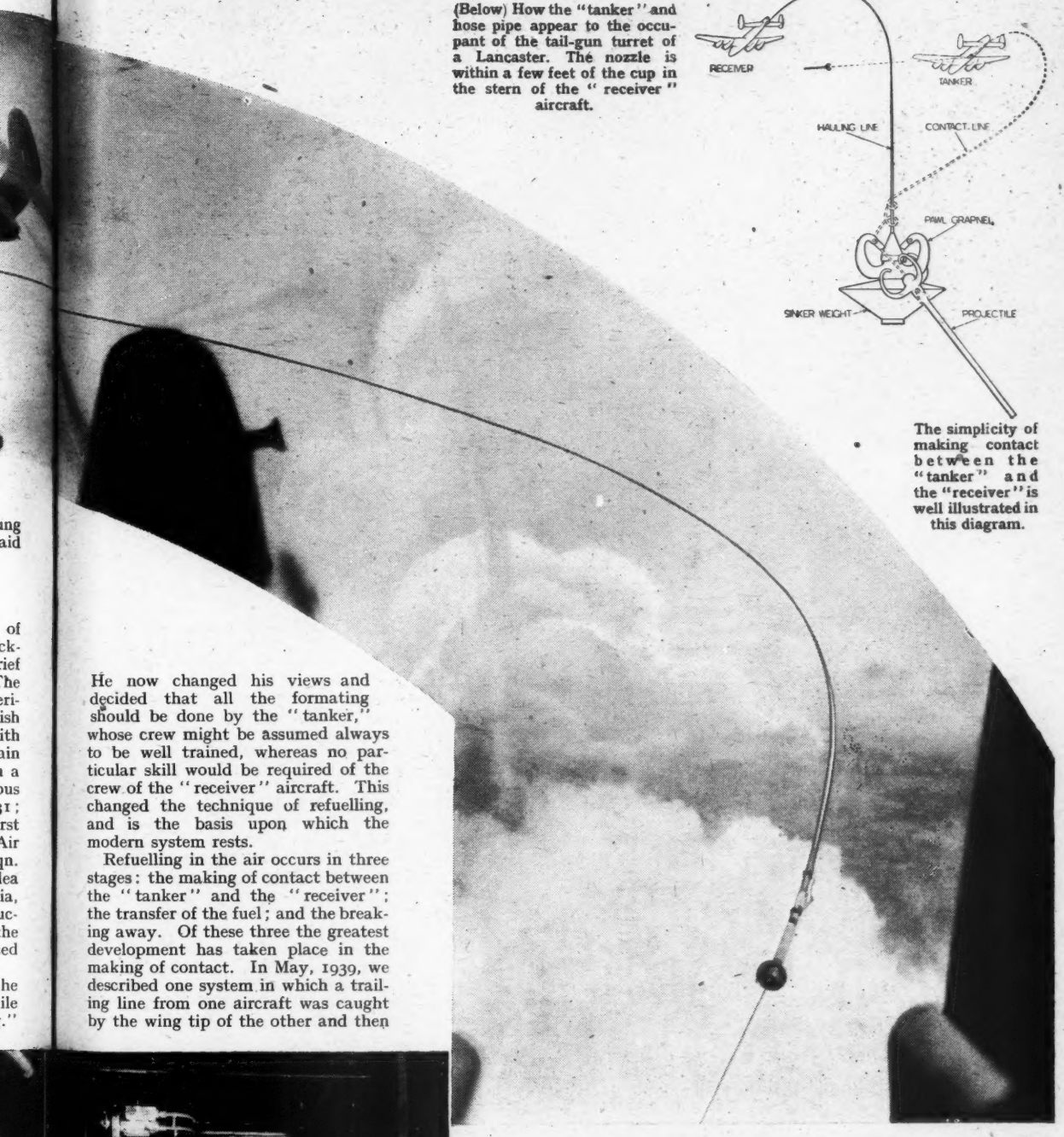
Before describing Sir Alan Cobham's modern method of refuelling in flight, it may be well to establish the background against which it should be seen by giving a brief historic survey of how the system has developed. The idea came to Sir Alan from the crude American experiments in which light planes were made to establish phenomenal endurance records by "feeding" them with fuel for engine and crew from other aircraft at certain intervals. That, as we have said, was little more than a "stunt," but in it Sir Alan saw possibilities for serious application. He first began to ponder the idea in 1931; by 1932 ordered planning was begun, and in 1933 the first actual experiments were made. The next year the Air Ministry became interested and Sir Alan Cobham and Sqn. Ldr. Helmore started on a non-stop flight to India, the idea being that the R.A.F. should refuel him at Alexandria, Basra and Karachi. The little Airspeed Courier was successfully refuelled over Malta, but shortly afterwards the throttle lever broke, the engine petered out and a forced landing on Malta brought the experiment to an end.

Up till this time Sir Alan had visualised that the "tanker" should fly steadily on a straight course while the machine to be refuelled should do the "formating."





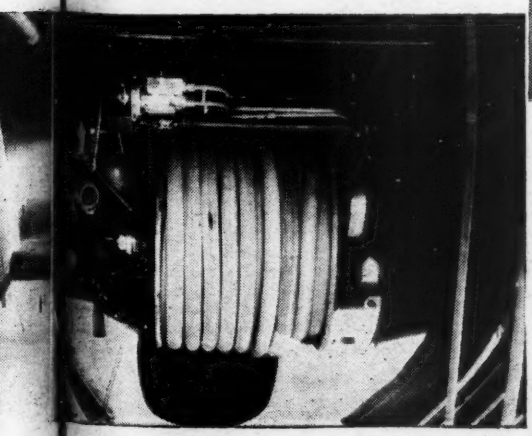
(Below) How the "tanker" and hose pipe appear to the occupant of the tail-gun turret of a Lancaster. The nozzle is within a few feet of the cup in the stern of the "receiver" aircraft.



The simplicity of making contact between the "tanker" and the "receiver" is well illustrated in this diagram.

He now changed his views and decided that all the formating should be done by the "tanker," whose crew might be assumed always to be well trained, whereas no particular skill would be required of the crew of the "receiver" aircraft. This changed the technique of refuelling, and is the basis upon which the modern system rests.

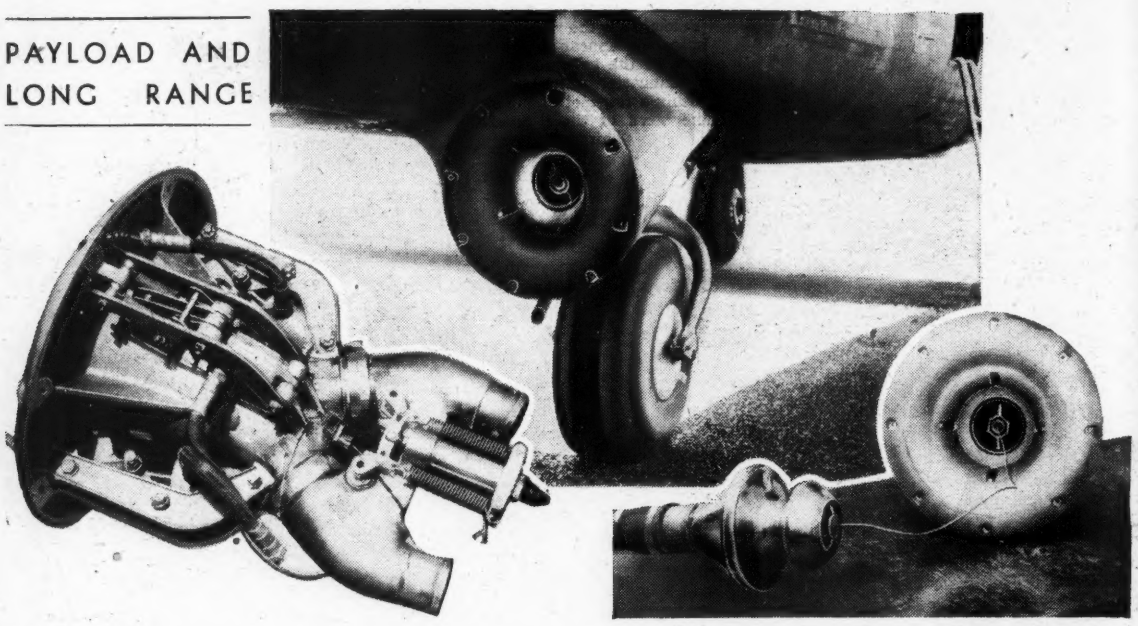
Refuelling in the air occurs in three stages: the making of contact between the "tanker" and the "receiver"; the transfer of the fuel; and the breaking away. Of these three the greatest development has taken place in the making of contact. In May, 1939, we described one system in which a trailing line from one aircraft was caught by the wing tip of the other and then slid along to a catch on a line which bound the two machines together.



In the Lancaster the two cargo tanks are placed in tandem and feed to the axis of the hose drum unit. The three views on the left show the front tank, the space for the second tank, and the drum unit.

In the modern method, which is to all intents and purposes completely reliable, contact is made by firing a sort of line-carrying harpoon from the "tanker" into the curve of the trailing line from the "receiver" aircraft. This operation requires far less skill on the part of the "tanker" crew, and none at all from the crew of the "receiver," except the ability to fly a steady straight course. The harpoon is not manually aimed but is set at a forward angle, and the "tanker" pilot has quite a wide margin of formational position within which the harpoon will get the contact line through the curve of the trail-

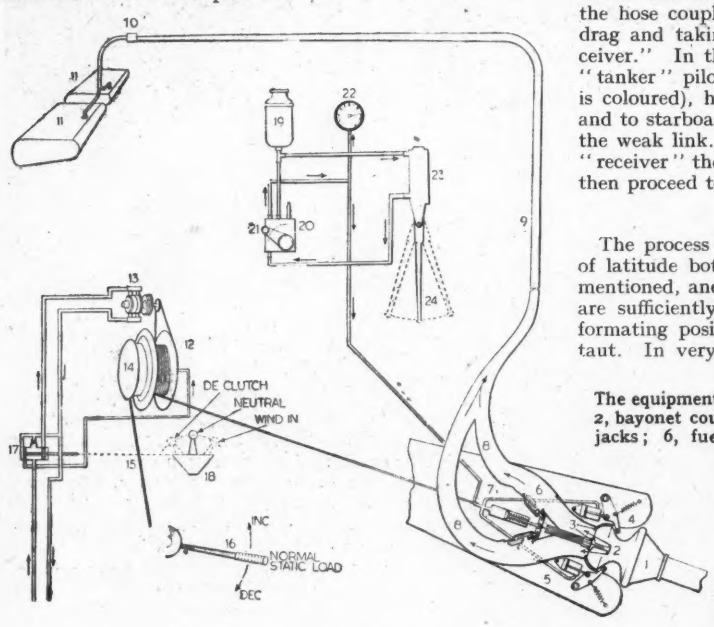
PAYLOAD AND LONG RANGE



The upper picture shows the cup in the stern of the "receiver." On the left is a view of the reception unit, with its four toggles and bifurcated pipe line, and on the right the cup, nozzle and hauling line. A neoprene seal makes a fuel-tight joint between nozzle and cup.

ing line from the "receiver." Even in the dark it has been found that it is quite easy to illuminate the trailing line sufficiently for the "tanker" pilot to establish correct formation.

Although it is in the initial making of contact that the greatest progress has been made, detail improvements in the rest of the equipment have resulted not only in greater reliability but also in making possible the transfer of fuel from one aircraft to the other at much greater speeds. With the Avro Lancasters at present being used for development purposes and training, fuel has been successfully transferred at speeds in the region of 200 m.p.h. and there is no reason to doubt that if it should prove desirable to refuel at even greater speeds, the equipment could be modified to make this possible.



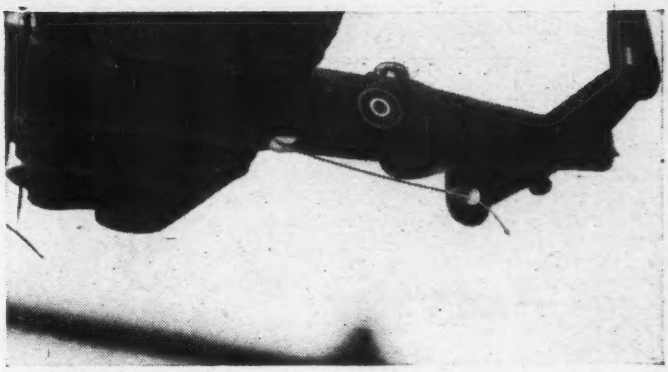
The equipment of the "receiver" aircraft: 1, hose nozzle; 2, bayonet coupler; 3, fuel seals; 4, toggles; 5, hydraulic jacks; 6, fuel valves; 7, hydraulic jack; 8, twin inlet pipes; 9, fuselage fuel pipe line; 10, anti-syphon valve; 11, main fuel tanks; 12, windlass; 13, hydraulic motor; 14, brake drum; 15, brake connection; 16, brake hand control; 17, hydraulic control valve; 18, remote control; 19, reservoir; 20, clutch control pipe; 21, auto release; 22, pressure gauge; 23, pump unit; 24, pump handle.

Briefly explained, the refuelling process runs as follows: the "tanker" formates on the "receiver," flying to starboard of the "receiver" and slightly below and behind it. The "receiver" trails his line and the "tanker" fires his harpoon into the curve of the trailing line. The two lines, that from the harpoon and the trailing line, lock together on touching each other, and the crew of the "tanker" wind in the contact line and the hauling line, to which they then attach the hose nozzle. The cone on the end of the hose pipe locks into a cup in the tail of the "receiver." The "tanker" now takes up a position slightly above but still to starboard of the "receiver" in order to provide the necessary "head" for the fuel to run to the "receiver" by gravity. When the desired amount of fuel has been transferred, the "receiver" crew release the hose coupling, the hose breaking away under the air drag and taking with it the hauling line from the "receiver." In this line there is a weak link, and when the "tanker" pilot sees this link clear (the line at this point is coloured), he breaks formation by veering off upwards and to starboard, thereby tightening the line and breaking the weak link. The "tanker" winds in his hose and the "receiver" the rest of his trailing line, and the two aircraft then proceed to their respective destinations.

Wide Margin of Safety

The process is simple enough, and there is a good deal of latitude both in the firing of the harpoon, as already mentioned, and in the formating, since both lines and hose are sufficiently long to permit of quite a wide range of formating positions without either line or hose becoming taut. In very bumpy weather this is important. Even

PAYLOAD AND LONG RANGE

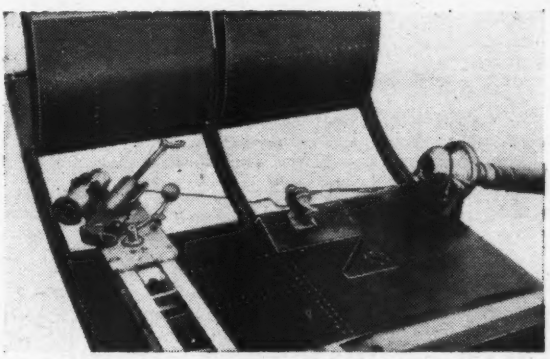


A parachute or drogue near the end of the hose pipe has a steadying effect and keeps the hose from flailing about while it is being wound-in

if the hose should be drawn taut by an unusually severe gust, for example, it would not spell disaster, for the coupling of the hose nozzle to the cup on the "receiver" is so arranged that at a pre-determined pull the coupling is automatically released. This pull is not great enough seriously to upset either aircraft. The "tanker" is almost unaffected since the hose drum is nearly amidships. The "receiver" would, of course, feel the pull most, as the coupling is in the extreme stern, but even this is not sufficient to throw the machine into a dive.

Many other safeguards have been taken. For example, the possibility of fire being caused by sparking due to differences in potential in the two aircraft has been eliminated by flushing the fuel pipes with nitrogen. Automatic valves guard against spilling of fuel, syphoning of fuel, and collapse of any part of the hose due to too great difference in internal and external air pressure. It may be of interest to examine these features of the equipment a little more closely.

An interesting and useful aspect of the "receiver" equipment is that it is quite simple, takes up but little space, and weighs little more than three hundredweight. It merely comprises the reception coupling in the stern; a pipe line from this coupling to the fuel tanks; a hauling line with which to haul in the hose pipe; and a windlass for hauling in the line. In the earlier experiments the windless was hand-operated. Now the drum is power driven from the normal hydraulic services of the aircraft through a multi-plate clutch. The drum is freed by de-clutching and is then controlled by brake shoes operated by a hand lever. One lever controls the windlass. It has three positions: "de-clutch," "neutral" and "wind-in."



The harpoon gun (left) with its coiled line. In the centre is the friction vice which holds the line while the operator disconnects the sinker weight and attaches the bayonet coupling to the hauling line. On the right the nozzle of the hose pipe.

On the drum of the windlass is wound 250ft. of 5-cwt. cable. This is rubber covered to prevent it from kinking and coloured orange in order to make it easily visible to the "tanker" pilot. This line is known as the weak-link line; joined to it by a weak link is the hauling line, which is also 250ft. long, but 15-cwt. cable.

At its free end the hauling line terminates in a bayonet-type coupler. This is inserted in the sinker weight on the end of the line. The sinker weight is cone-shaped and is, of course, used for imparting a curve to the hauling line, which without it would trail almost straight back and would whip about. When the nozzle of the hose has been hauled in, the sinker weight is unshipped and the bayonet coupler secured to the nozzle.

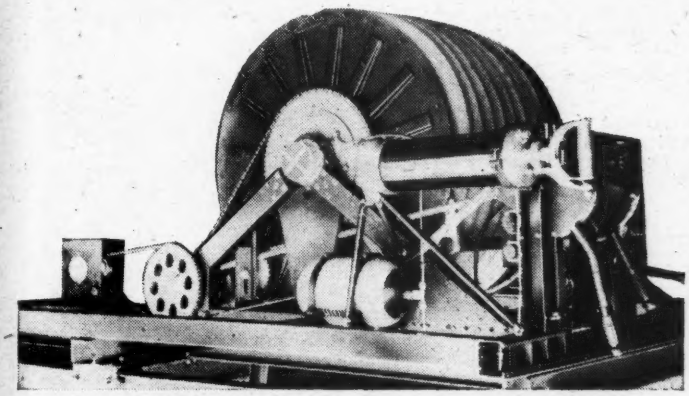
Fitted around the top of the bayonet coupler after the latter has been inserted in the sinker weight is a grapnel with pawls which prevent the harpoon line from slipping off. The hauling line is led from the reception coupling to the windlass through a conduit tube to prevent fouling inside the aircraft.

The reception coupling is a bell-mouthed unit fitted in the starboard underside of the stern of the "receiver" aircraft. Its principal function is to house the ball end of the hose nozzle, and a fuel-tight joint is made by means of neoprene seals and four hydraulically-operated toggles which grip the nozzle and press it against the seals.

In order to allow the hauling line to pass through the centre of the reception coupling, the fuel line is bifurcated at the throat. Each of the two branches has a fuel flap valve which is operated by a hydraulic jack in conjunction with the toggles of the reception coupling. When the hose nozzle is held by the toggles the flap valves are open, and when the toggles disengage the flap valves are closed.

From the bifurcation the fuel line continues as one pipe passing along the upper part of the fuselage until finally it branches again into the two main tanks. Where the lines join their tanks they are fitted with special valves the purpose of which is to prevent flooding of the tanks. There is also in the pipe line a non-return valve which prevents syphoning.

The equipment of the "tanker" is of necessity a good deal more comprehensive. In the Lancaster used as a "tanker" there are two cargo fuel tanks, each of 600-gallons capacity,



The hose pipe drum unit. Fuel enters from the cargo tanks into the axis of the drum. The hand pump is a syphon starter used purely as an emergency unit. Normally, gravity-feed does all that is necessary.

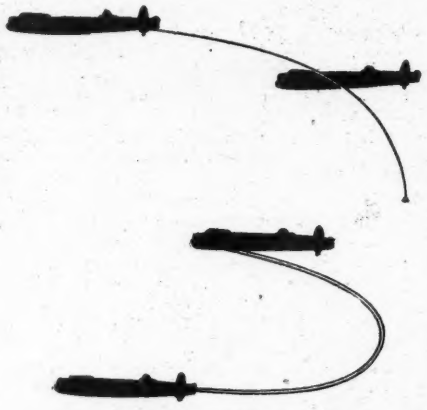
PAYLOAD AND LONG RANGE

installed in the forward part of the bomb bay. The two tanks are interconnected and also, of course, connected to the hose drum unit. Since the drum has to rotate in order to pay out and wind-in the hose, the connection from the cargo tanks is to a revolving joint which is part of the axis of the drum. The drum is, as already mentioned, driven by and geared to a hydraulic motor. A powerful brake is used in conjunction with a drum stop lever. This comes into operation just before the last coil of the hose is wound-off.

The hose pipe is 250ft. long and has an inner bore of 2in. diameter. It is of petrol-resisting rubber, reinforced with a woven sheath and bonded with a spiral of steel wire having a breaking strength of nearly 6,000 lb. At the free end of the hope pipe is the large metal nozzle, which is shaped to form a ball-and-socket joint with the cup in the reception coupling of the "receiver." An interior attachment of this nozzle enables the bayonet coupler at the end of the receiver's hauling line to be engaged with the nozzle.

From the rear cargo tank the main feed is in the form of a large copper pipe which connects first with the main fuel valve. This is opened by hydraulic power, and the flow then proceeds to the centre coupling at one side of the hose drum and thence through the hose. An emergency unit known as a syphon starter is incorporated. This draws fuel from the tank side of a non-return valve placed between the main fuel valve and the hose drum. When the piston of the starter is pushed forward, exuding the fuel previously admitted, the non-return valve closes and the fuel is pumped into the hose. This causes the normal flow to proceed, but normally gravity flow is all that is needed.

Mention has been made of the fire-precaution of flushing the fuel system with nitrogen. This is carried compressed in a steel bottle, and its expansion is controlled by a relief valve set at about 10 lb./sq. in. The nitrogen under pressure flushes the whole system, from the cargo tanks through the hose and right to the vents in the tanks of the "receiver," so that there is inert gas in all the piping and above the fuel levels of all the tanks. Flushing with nitrogen is done both before and after passing the fuel.



The upper diagram shows the formation used while making contact by firing the harpoon. In the lower is shown the position taken up by the "tanker" and "receiver" while fuel is being transferred.

Finally a few words might be said about the line-throwing gun which fires the harpoon carrying the contact line. The gun, as mentioned earlier, is not aimed by the operator but is mounted to fire forward at an angle of 41½ deg. to port. When the operator pulls the trigger, a blank cartridge is fired and ejects from the muzzle of the gun a steel shaft to which is attached one end of a light steel cable about 300ft. long. This cable is carried wound spirally inside a tubular container, and spare harpoons and cable tubes are carried in case the first shot should miss, but after a certain amount of practice "misses" are not often experienced.

MASTER BOMBER'S POSTHUMOUS V.C.

THE Victoria Cross has been posthumously awarded to Squadron Leader Ian Willoughby Bazalgette, an R.A.F. "master bomber" of the Pathfinder Force. The citation reads:—

"On August 4th, 1944, Squadron Leader Bazalgette was 'master bomber' of a Pathfinder squadron detailed to mark an important target at Trossy St. Maximin for the main bomber force.

"When nearing the target his Lancaster came under heavy anti-aircraft fire. Both starboard engines were put out of action and serious fires broke out in the fuselage and the starboard main plane. The bomb aimer was badly wounded.

"As the deputy "master bomber" had already been shot down, the success of the attack depended on Squadron Leader Bazalgette, and this he knew. Despite the appalling conditions in his burning aircraft, he pressed on gallantly to the target, marking and bombing it accurately. That the attack was successful was due to his magnificent effort.

"After the bombs had been dropped the Lancaster dived practically out of control. By expert airmanship and great exertion Squadron Leader Bazalgette regained control, but the port inner engine then failed and the whole of the starboard main plane became a mass of flames.

"Squadron Leader Bazalgette fought bravely to bring his aircraft and crew to safety. The mid-upper gunner was overcome by fumes. Squadron Leader Bazalgette then ordered those of his crew who were able to leave by parachute to do so. He remained at the controls and attempted the almost hopeless task of landing the crippled and blazing aircraft in a last effort to save the wounded bomb-aimer and helpless air-gunner. With superb skill and taking great care to avoid a small French village nearby, he brought the aircraft down safely. Unfortunately, it then exploded and this gallant officer and his two comrades perished.

"His heroic sacrifice marked the climax of a long career of operations against the enemy. He always chose the more dangerous and exacting roles. His courage and devotion to duty were beyond praise."

Squadron Leader Bazalgette was born in 1918 at Calgary, Alberta, and his home was at New Malden, Surrey. In September, 1940, he received a commission in the Royal Artillery, which he relinquished in September, 1941, on being granted a commission in the R.A.F.V.R.

He was awarded the D.F.C. in July, 1943, when it was stated that he had carried out attacks on heavily defended targets, including Duisburg, Berlin, Essen and Turin.

VICTORY THROUGH AIR SUPPLY

AN ornamental Japanese sword, captured in the fighting in Burma, was presented to Air Marshal Sir Ralph Cochrane, C.-in-C. Transport Command, as a memento of his visit to the headquarters of the R.A.F. Battle Supply Group directly engaged in the fight against the Japanese, states Air Ministry News Service.

The presentation was made by Air Commodore J. D. I. Hardman, the air officer commanding.

Air Marshal Cochrane told the assembled officers: "You were the pioneers of air supply, and from England we watched with absorbing interest your powerful force develop. Without it the Burma war could never have been won."

Air Marshal Cochrane compared the revolutionary methods of supply used in Burma with Hannibal's use of elephants on his conquering march over the mountains.

He said that Transport Command in South-east Asia would have work to do for many months afterwards. Their chief work would be flying servicemen back to England.

Civil Stirling

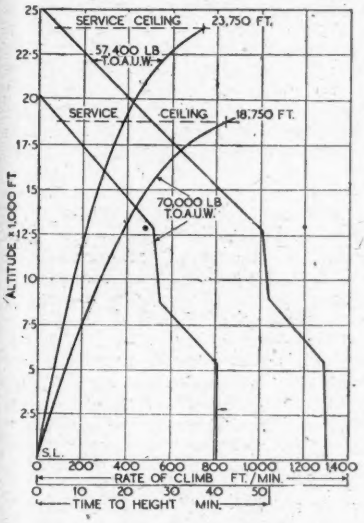
Particulars of Conversion : Interesting Estimations of Assumed Operating Costs

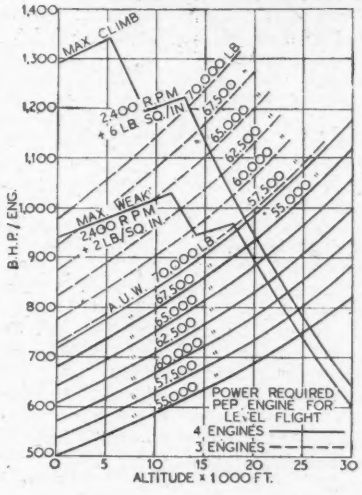
THE preliminary announcement of the fact that Stirlings were available for conversion to 18-passenger mail and freight aircraft was made in the August 9th issue of *Flight*. As noted in that announcement, the conversion is not hindered by complexity, and, although the new guise can be considered only as an interim measure, there is no doubt that a great deal of very useful work could be found for the aircraft. The

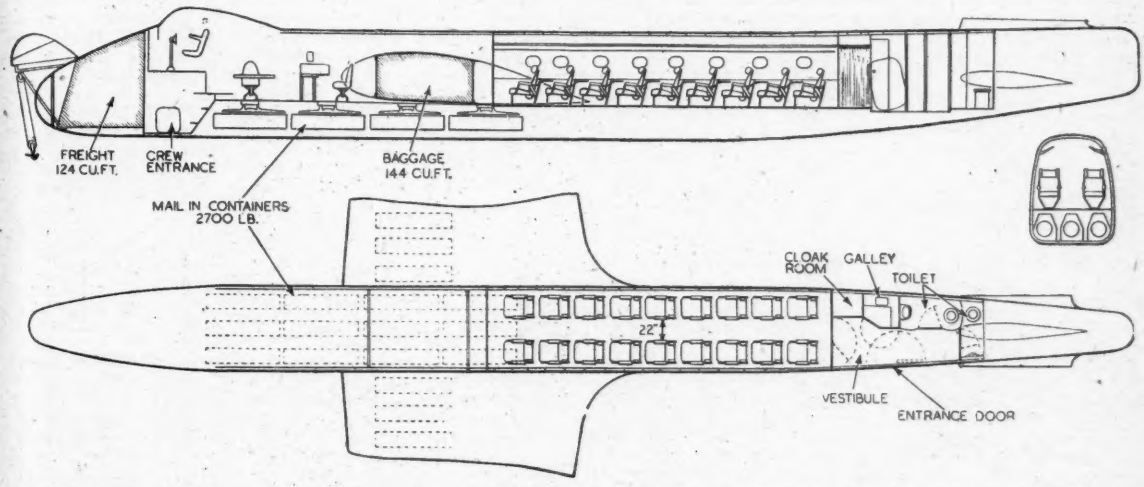
Looking aft through passenger cabin showing roominess of seat pitching and generously wide aisle.

primary air-frame structure is unchanged and does not differ in any respect from that of the Stirling V, the only modifications being confined to the rearrangement of the interior and associated equipment in order to accommodate passengers and freight. There is no change in the external shape of the machine, although a neat tail cone fairing might with advantage be fitted in place of the existing turret structure.

As shown in the accompanying photograph and interior layout arrangement, accommodation for 18 day passengers is provided in two rows of nine chairs on each side of an aisle of ample width. The chairs are of standard I.P. pattern with winged







Layout and disposition arrangement for passengers, freight and mail. Above are performance curves for (left) rate of climb and time to height, and (right), aircraft ceiling under varying conditions.

CIVIL STIRLING

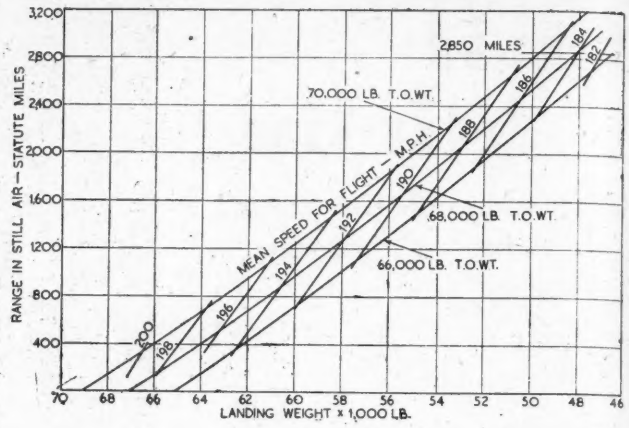
head-rests adjustable for height and complete with built-in folding tables. The chairs are also adjustable for rake of back rest, and side-arm supports further add to the measure of comfort.

The passenger cabin is suitably furnished with heating, ventilating and air-extractor ducts, and, in addition to the main electric lighting, individually controlled reading lights are fitted at each seat station. Circular window ports are pitched one to each seat, and, considering that the aircraft is a converted bomber and in the light of the obtaining structural limitations, individual window area is very generous; in fact, the only item about the fenestration with which one can cavil is that, unfortunately, the windows are placed at rather too high a level; but here again it is probably structural features which have determined their setting.

Light luggage racks are fitted throughout the cabin length for passengers' personal effects, and the whole of the interior walls, together with floor coverings, curtains and interior trimmings generally, can be finished in pattern and colour to suit the requirements of the purchaser. The existing aft entrance door on the port side will be retained for the use of passengers, and a small compartment for the stowage of coats, etc., is located immediately aft of the passenger cabin on the starboard side. To the rear of this is a galley fitted with stowages for thermos flasks and similar utensils for the carriage of hot or cold refreshments. Two lavatories fitted with wash-basin, mirror, chemical closet, etc., are arranged aft of the galley.

Freight up to a maximum of 1,300 lb. is catered for in the nose compartment forward of the flight deck, the available space being 124 cubic feet. Loading is facilitated by an upward hinging hatch in the extreme nose, and, in view of the height of this hatch above the ground, the inclusion of freight-hoisting equipment is a worthwhile detail. Freight lashing points are, of course, provided. Crew's entrance to the flight deck is through an existing hatch in the underside, a telescopic ladder being provided.

Each passenger is nominally allowed 30 lb. of personal luggage, which is conveniently stowed in the fuselage space between the wing spar frames, this space totalling no less than 144 cubic feet. Provision is made for the carriage of mail in cylindrical containers to be supported from the standard bomb carriages within the wing cells and fuselage bomb bay. As may be seen from the accompanying tabulations of weight cases, when carrying freight of such density that not more than 850 lb. can be accommodated in the nose compartment (Case "A"), it is necessary for reasons of c.g. to carry 18 of these mail containers in the foremost positions. If, however, as shown in Case "B," high-density unit loads are to be carried in the nose freight compartment up to the limit of 1,300 lb., then 24 mail containers may be carried.

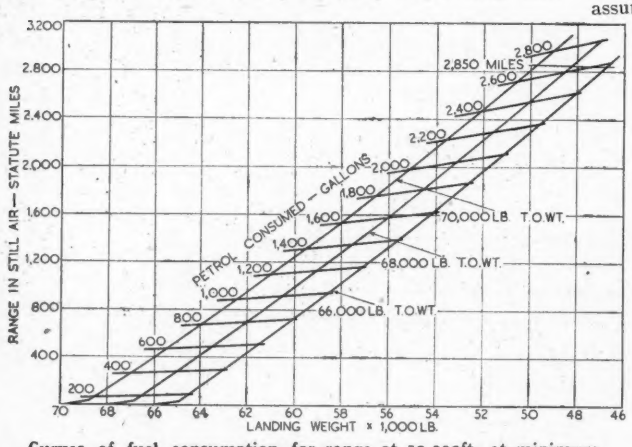

RANGE IN STILL AIR — STATUTE MILES
LANDING WEIGHT x 1,000 LB.
2,850 MILES
70,000 LB. T.O.WT.
68,000 LB. T.O.WT.
66,000 LB. T.O.WT.
MEAN SPEED FOR FLIGHT — M.P.H.

Curves of range and approximate mean speed at 10,000ft. at minimum comfortable continuous cruising speed. Speeds given are at the mean weight for the flight.

For the purpose of estimating an approximation of the likely operating costs, the following basic assumptions have been made by the manufacturers:—

Range, 1,000 miles (still-air conditions). Average air speed, 195 m.p.h. Block-to-block speed, 190 m.p.h. This includes time allowances for taxying, climbing, etc., and for the effect of wind.

The aircraft will make one return trip per day for six days per week, which totals approximately 3,300 hours per year. The pilot, co-pilot and stewards are assumed to work for approximately 1,000 hours per year, and, therefore, allowances have been made for 3.3 pilots, 3.3 co-pilots and 6.6 stewards per year. Depreciation is assumed at 20 per cent. per annum, which gives the life of the aircraft at five years. Original cost is assumed at £35,000. Insurance for the aircraft is taken to be 10 per cent. of the original cost per annum; for the crew at £5 per cent. of pay per annum; and for passengers, freight, etc., at £750 per annum. Aircraft repairs and renewals will, it is suggested, absorb £3,300 per annum, whilst engines and airscrews will cost £700 per engine and airscrew for overhaul and replacement of parts every 400 hours. Four sets of tyres at £325 per set will cost £1,300 per annum, and landing fees at £3 per landing will run into £1,872 per annum. Other expenses are assumed to cost £10,000 per annum. These estimations are tabulated below to give the assumed cost per hour and per aircraft-mile.



Curves of fuel consumption for range at 10,000ft. at minimum comfortable continuous cruising speed.

COST ESTIMATES FOR CIVIL STIRLING

	Per Hour	Per A/c Mile
	£ s. d.	d.
Pilot's pay, £1,500 per annum	1 10 0	1.88
Co-pilot's pay, £1,000 per annum	1 0 0	1.26
2 Stewards' pay, £350 per annum	14 0	0.88
Fuel—1,000 galls. at 2/- per gall.	18 18 0	23.90
Oil—60 galls. at 5/- per gall.	2 16 9	3.57
Depreciation	2 2 6	2.67
Insurance (a) Aircraft	1 1 2	1.36
(b) Crew	3 2	0.20
(c) Passengers & Freight	4 6	0.27
Aircraft repairs and renewals	1 0 0	1.26
Maintenance of engines & airscrews	7 0 0	8.86
Tyres	7 10	0.48
Landing fees	11 4	0.71
Other expenses	3 0 7	3.82
	£40 9 10	51.12d.

CIVIL STIRLING

Therefore : $\frac{£40\ 9\ 10}{190\ (B\text{-}B)} = \frac{810}{190} = 4.26 = 51.12$d. per aircraft mile

TYPICAL WEIGHT AND LOADING CASES

CASE "A"

	Weight in lb.
Part estimated empty weight incl. Galley equipment	46,000
Add—Crew of 4	880
Payload—Total 7,150 lb. = 11.53 per cent. A.U.W. made up as follows :—	
18 passengers—170 lb. per passenger	3,060
Baggage allowance of 30 lb. per passenger stowed in Centre Section	540
Freight stowed in Nose	850
Mail in 18 containers—12 stowed in first four rows of fuselage bomb bay, 6 stowed in wing cells	2,700
18 Containers and carriers	480
Fuel—Petrol 1,000 gallons	7,200
Oil 60 gallons	540
A.U.W. Take-off =	62,250

C.G. Position at Take-off is at 119in. Aft of Datum or 36.2 per cent. M.A.C.

Flying : C.G. Position is at 119.6in. Aft of Datum or 36.52 per cent. M.A.C.

Landing : Assuming all fuel used excepting 2 hrs' oil, A.U.W. = 54,454 lb.

C.G. Position is at 121.2in. Aft of Datum or 37.37 per cent. M.A.C.

CASE "B"

	Weight in lb.
Part estimated empty weight including Galley equipment	46,000
Add—Crew of 4	680
Payload—Total 8,500 lb. = 13.38 per cent. A.U.W. made up as follows :—	
18 Passengers—170 lb. per passenger	3,060
Baggage allowance of 30 lb. per passenger stowed in Centre Section	540
Freight stowed in nose	1,300
Mail in 24 containers, 18 stowed in first 6 rows of fuselage bomb bay, 6 stowed in wing cells	3,600
24 containers and carriers	640
Fuel - Petrol 1,000 gallons	7,200
Oil 60 gallons	540
A.U.W. Take-off =	63,560

C.G. Position at Take-off is at 119.5in. Aft of Datum or 36.47 per cent. M.A.C.

Flying : C.G. Position is at 120.2in. Aft of Datum or 36.84 per cent. M.A.C.

Landing : Assuming all fuel used excepting 2 hrs' oil. A.U.W. = 55,963 lb.

C. G. Position is at 121.7in. Aft of Datum or 37.64 per cent, M.A.C.

LIMITS OF PERMISSIBLE C.G. TRAVEL

Condition	C.G. LIMITS	
	Inches aft of Datum	Percentage of M.A.C.
Take-off	109.5—121.0	31.13—37.27
Flying	109.3—123.5	31.02—38.60
Landing	102.2—122.1	27.25—37.35

On the basis of the assumed operating costs and the weight cases given, representative costs per ton/mile and per passenger/mile for three different percentage load capacities are given as follows :—

COST PER TON/MILE

Payload = 8,500 lb. = 3.8 tons (1 ton = 2,240 lb.).

100% load capacity $= \frac{810}{3.8 \times 190} = 1.12/- = 1/1\frac{1}{4}$d. per ton mile

80% " " $\frac{810}{3.04 \times 190} = 1.4/- = 1/5$d. " "

65% " " $\frac{810}{2.47 \times 190} = 1.7/- = 1/8\frac{1}{2}$d. " "

COST PER PASSENGER MILE

No. of Passengers	Percentage Load Capacity	Price per Pass/mile
18	100	$\frac{51.12}{18} = 2.84$d.
14	80	$\frac{51.12}{14} = 3.65$d.
12	65	$\frac{51.12}{12} = 4.25$d.

AIRSTRIP ON CORAL STRAND

THE Cocos Islands, midway between Ceylon and Australia and 700 miles south-west of the Japanese-held islands of Java, have been garrisoned by South-East Asia Command and established as a base for the Royal Air Force.

An airstrip big enough to take the largest aircraft is now in use as a staging post between India and Australia. "D-Day" was April 3rd, when shiploads of troops and equipment entered the lagoon and crossed to the main island in landing barges. The landings were the climax to smaller ones by contingents of surveyors and technicians who had prepared the way. Indian engineers had worked like beavers day and night to make ready for the beachhead.

Every square yard of the island was planted with coconut trees, part of a copra-producing scheme started by the Clunies Ross family a century ago. There was not a single clearing, and before any equipment could be taken ashore thousands of trees had to be cut down.

The earliest arrivals slept in the open on ground sheets often soaked by tropical rainstorms. Sometimes in the darkness large land crabs, found in few other places in the world, scuttled over them. Rats which had never seen a human being before were uncomfortably friendly.

After the main party arrived, bulldozers for weeks ploughed among the 50ft. high coconut trees uprooting and pushing them over like ninepins. Ultimately out of the wilderness the airstrip emerged, nearly 2,000 yards long and 50 yards wide, a dead level runway of steel mesh over powdered coral.

First aircraft to reach the island were Spitfires to defend the new base against the possibility of Japanese air attack, followed by a R.A.F. air-sea rescue unit.

Already personnel of the R.A.F. and Army units stationed at Cocos have established friendly relations with the islanders, and regular football matches between representative sides are a feature of the troops' existence. The islanders, short, stocky and well developed, play barefooted, and in a dozen games have been beaten only once.

Thome Island Settlement at Cocos was started in 1825 by Clunies Ross, a Shetland sea captain, who later established himself as undisputed king of the Cocos. Within the settlement exists complete social security. The estate employs everyone on copra production, fishing-boat building and other trades, and guarantees a living and allows pensions on retirement.

In many respects Thome Island Settlement was a model community which a strange trick of fate threw into the part of a world war.

GREENOCK'S PART IN U-BOAT WAR

GREENOCK, as a flying-boat repair and conversion base, played a vital part in winning the Battle of the Atlantic. In 1939, experts saw the danger of flying-boat repair capacity in the South of England becoming overtaxed, and perhaps made useless. Scottish Aviation took over the derelict Caird's shipyard at Greenock, which was later requisitioned by the Ministry of Aircraft Production. When the Battle of the Atlantic was at its worst American-built Catalina flying boats made the long flight from San Diego to Bermuda and on to Greenock. They were converted to R.A.F. Coastal Command standards and armed for the mid-Atlantic U-boat Patrol. At that time, output of Catalinas from Greenock carried highest priority, and Greenock workers worked day and night.

RADAR

In the operations room of a radar station where the W.A.A.F. played a vital role.

Story of a War-winning Device : Some of the Men Who Developed It : British Scientist Solved Centimetric Wave Problem : Germans Were Always One Jump Behind Allies

ALTHOUGH overshadowed by the news of Japan's capitulation, the full story of the development and numerous uses of radiolocation—or radar, as it is now more popularly called—was told to the world for the first time last week. But for the coincidence that this epic story was released on August 15th, VJ-Day, it would have occupied the front page of every newspaper in Britain and America, for Sir Stafford Cripps did not exaggerate when, at the Press Conference the day before, he said that radar had "played a greater part in the war than the atom bomb itself."

It can be assumed that most readers of *Flight* have had (apart from "magic eye" and "gen box" stuff) at least a nodding acquaintance with radar for some considerable time; many of those in the Services, especially the R.A.F., will for long have been intimately acquainted with one or another of its numerous applications, but the outline of its history, the extent to which, on land and sea as well as in the air, it contributed to the defeat of Germany may not previously have been so widely realised. And again in the words of Sir Stafford Cripps (who was chairman of the Radio Board 1942-45) "now that we can concentrate our thoughts on the problems of peace, we see that radar possesses far more immediate potentialities for the service of the human race even than the splitting of the atom."

For the benefit of anyone who might be a bit hazy on the point, radar is the use of high-powered wireless pulses, or brief, rapidly recurring bursts of radio energy, which in most applications of the system are reflected from solid objects. The time taken by the echo to return to the transmitting point tells its distance which, in almost all systems, is measured visually by causing variations in the appearance of a pattern of light on a cathode-ray tube. The direction and other characteristics of the echo are normally used to locate the object.

An article on some of the systems used appeared in *Flight* of June 21st, 1945.

Anglo-American Effort

Before going any further it should be made clear that the development of radar has been a brilliant example (but by no means the only one) of Anglo-American co-operation. In August, 1940, some four months before America entered the war, Britain took the initiative by giving all her radar secrets to the U.S., though some of the devices of which we informed her had already been developed over there.

The cause of the greatest revolution in radar, however, and the common stem from which grew the British and American modern developments on wavelengths of a few centimetres, was the British magnetron valve devised during the war and capable of generating radio energy of many kilowatts on those tiny wavelengths. Since those first days the co-operation in radar research and development has been so close that it is virtually impossible to separate the British and American shares. Incidentally, the pioneer American laboratory still cherishes the original valve given by the British mission which took our secrets across.

But the fact that no American names are mentioned in this article is not due to any competitive motive. On the contrary it is by agreement with our Allies that the British Press should confine itself to giving publicity to its own people, while the American Press deals likewise with the equally valuable contributions of its own scientists.

So far as Britain is concerned, Sir Stafford Cripps pointed out that had her scientists and radio engineers not been working on this invention long before war broke out, it is very doubtful indeed whether we in this island would have been able "to hold the fort in those critical years of our lonely struggle in 1940-41, when Germany threw the whole weight of her air armada against us and was trying, with a considerable measure of success, to cut our life-line on the sea with her U-boats."

Sir Stafford disclosed that at about the time of Hitler's accession to power in 1933, the Air Staff and the scientists who were working with them began to be very worried because there was no known way of detecting the approach of aircraft at a distance and

RADAR

no way of seeing them or following their course in overcast weather or by night. H. E. Wimperis, the director of scientific research at the Air Ministry, and A. P. Rowe, who was then his scientific assistant, urged the need for some new action to solve this problem. Action followed immediately, which showed what they thought of the chances of "peace in our time" even then.

Lord Swinton, who was then Secretary of State for Air, appointed a committee consisting of Sir Henry Tizard, Professor A. V. Hill and Professor Patrick Blackett (three scientists with wide knowledge and experience) to work with the Air Staff and help them in solving these problems. Wimperis was also a member of the committee and Rowe was its secretary.

The Starting Point

To understand what this committee achieved, it is necessary to refer to the fundamental radio research work carried out much earlier under the auspices of the Department of Scientific and Industrial Research. E. V. Appleton (now Sir Edward Appleton), of Cambridge University, had succeeded in proving the existence and measuring the height of the "heaviside layer" in the atmosphere above the earth by the use of radio range-finding measurements. These measurements were the first ever made in radio range-finding. This was followed shortly afterwards by Appleton's adoption, and wide extension, of the "pulse" methods first used by the American scientists.

SILENT SENTINEL: One of the 195ft. radar towers in the coastal chain used to detect the approach of low-flying sneak raiders.

Proceeding from the possibilities thus opened up, R. A. Watson-Watt (now Sir Robert Watson-Watt) early in 1935 produced the first practical and detailed proposals for locating aircraft by radio. From this moment started the development of radar as we have come to know it, and progress was rapid considering the great complexity of the subject.

Within six months, by September, 1935, the first radar station was in operation and aircraft approaching these shores were being located 50 miles away. This was the first installation anywhere in the world.

By September, 1938, when danger to this country seeemed acute, the range of detection had been increased to 150 miles. London was already reasonably protected against surprise air attack and we had been able to make our whole air defence system

NOCTURNAL ARCHER: From the nose of this night-fighting Beaufighter projects the "bow-and-arrow" antennae of its centimetric A.I. radar set.

more effective. On Good Friday, 1939, when the Germans marched into Prague, there began a 24-hour radar watch along the whole coast from Scapa Flow to Portsmouth. In September, 1939, when war broke out, the chain was complete.

Besides those already mentioned, other leading scientific workers in this first great step were two young members of the radio department of the National Physical Laboratory—A. F. Wilkins and E. G. Bowen. Following their early work Wilkins developed I.F.F., the complex method of identifying aircraft (friend or foe), while Bowen went on to pioneer work in airborne radar.

The first big operational test of radar, and the proof of its success, came in the Battle of Britain, which history will surely record as one of the decisive battles of the world. With the Battle of Britain by day is associated again the name of Sir Henry Tizard, who initiated the practice of controlled interception. (It was he also who led the British Mission to the U.S.A. in 1940.) With the Battle of Britain by night must be associated the use of A.I. or Air Interception, which was begun by Bowen's team, and the use of G.C.I. or Ground Control Interception, which Dr. Denis Taylor developed, using the P.P.I. (Plan Position Indicator) for the first of its many applications. There was another important use for radar, to enable the searchlights spotting enemy aircraft to open straight on to their target. This was known as "Elsie" (S.L.C.) and was largely the work of Harold Larnder and W. S. Eastwood.

The Normandy coast as seen on the screen of an H.2.S. set on D-Day. The line from the centre is a rotating scanner beam and the rings a scale.

While the application of radar to air defence was its earliest and most obvious use, during this time great strides were also being made in its applications to the needs of the Navy and Army. Since before the war Dr. W. S. Butement had been working on radar to locate ships as targets for coast defence artillery, and had made a very great advance in directional accuracy. At the same time P. E. Pollard was proving that radar range-finding was more accurate in dealing with aircraft than the big optical range-finder. From Butement's work came the coast artillery radar and the C.H.L., essential to air interception of the low-flyer; from Pollard came the G.L. set for unseen A.A. fire.

Meanwhile the Navy, having developed air warning sets for its ships, went on to development of radar for fire control. C. E. Horton was a leader in these developments, whilst J. F. Coales made noteworthy contributions to gunnery radar, which was eventually to play such an important part in sinking the *Bismarck* and the *Scharnhorst*.

Radar was also brought into effective use in the anti-U-boat war. Bowen and R. Hanbury-Brown were two of the scientists who were prominent in the development of the early airborne sets for locating surface ships and surfaced submarines.

RADAR

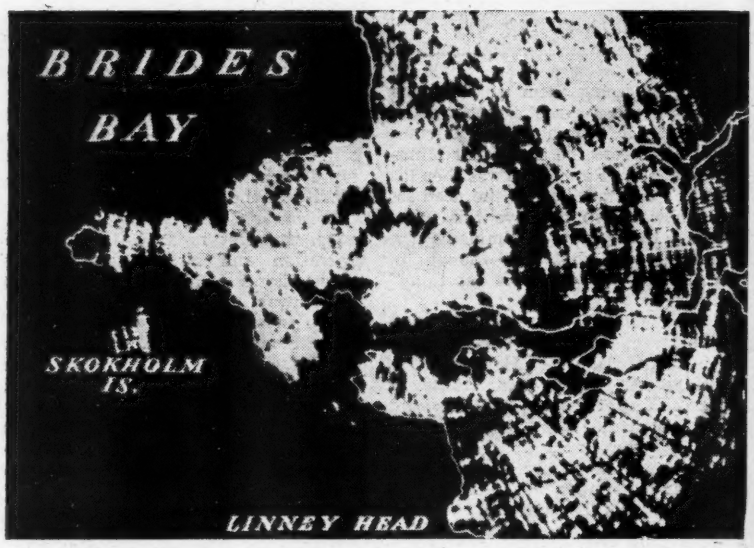
But all this, decisive as it proved in defence, was only a beginning. From the earliest days it had been realised that greater accuracy, and in particular the capacity to discriminate between the echoes from natural objects and those from the target, were required. Nothing but a narrow beam instead of the former "floodlighting" technique could give the results desired, and this meant much shorter wavelengths on high powers and high sensitivity.

From March, 1939, ninety of our leading physicists had been attached to the stations of the coastal chain. Their past experience made them appreciate the need for the short centimetric waves and resourceful in meeting it, and in July, 1940, Professor J. T. Randall, of Birmingham, produced the magnetron which was the first high-power generator of centimetric waves in the world. The magnetron remains the heart of all modern radar equipment.

Centimetric Sets

This new tool was eagerly seized upon by the radar researchers. It was supplemented by an equally novel receiving valve evolved by Dr. R. W. Sutton. The result was a centimetric ground radar set. This in turn became the precursor of the shipborne set vital to the war against the U-boat, and the centimetric G.L. equipment. Dr. Landale was responsible for the shipborne set, while Professor John Cockcroft and Dr. E. S. Shire were responsible for the centimetric G.L. equipment. This work was mainly shared out amongst the three Government Research Establishments, Admiralty Signals Establishment under Captain B. R. Willett and then under Captain T. W. B. Brooking, the Air Defence Research and Development Establishment (now the Radio Research and Development Establishment) of the Ministry of Supply under John Cockcroft, C. W. Oatley and O. G. Sutton successively, and the Telecommunications Research Establishment of M.A.P. under A. P. Rowe.

First came the centimetric version of A.I., the device carried in the night fighters which enabled the pilot to direct himself straight on to the enemy bomber. Professor P. I. Dee, Allen Hodgkin and W. E. Burcham were the leading figures in this development. The same technique gave us, in the hands of Dee and his team, a centimetric A.S.V., the device carried in Coastal Command aircraft which directed them to the surfaced U-boat and which, together with its shipborne brother in destroyer and corvette, finally led, in the Battle of the Bay of Biscay, to the defeat of the U-boat at a time when it seemed as if the whole of our war effort might be strangled by its activities.



GREEN PASTURES, as seen on the cathode-ray tube of an early H.2.S. set during an experimental flight over the Pembroke coast. The thin line added shows actual coastline.

Further slight changes at the hands of Dee, Skinner, A. C. Lovell and others produced the first H.2.S. set. This truly remarkable device, which shows visually in the heavy bomber a continuous picture of the unseen ground over which it is passing, made the ruins of Hamburg and Berlin its monument. Denis Robinson also made his contribution to the A.S.V. and H.2.S. projects.

Finally, there were three remarkable further aids to our offensive which were being developed at about the same time. The first of these was "Gee," the navigational system which enabled our bombers to know exactly where they were at any time *en route* to or from Germany. It was this device which made the 1,000-bomber raids possible and which increased the effectiveness of our bombing some three- to five-fold. On D-Day it was the universal navigational aid, for sea and air alike, so much so that it has been suggested it should have more appropriately been called Gee-Day. Gee was devised and developed by R. J. Dippy with the help of C. C. E. Bellringer.

Remote Control

Then came "Oboo," the system which gives the bomber its position even more exactly than Gee and by means of which the signal to drop its bombs on the target in Germany was given from the base in England. It provided the means of silencing alike the factories of the Ruhr and the coastal guns of Normandy. F. C. Williams, A. H. Reeves, and F. E. Jones were responsible for the development of this most ingenious device.

And thirdly there was "Rebecca-Eureka." By this means our airborne forces were enabled to direct themselves to any given point in hostile country where an advance party had already installed a "radar beacon." The system was devised by Williams, developed by J. W. S. Pringle, and nursed into operational use by A. W. Lines.

By this time there had grown up a kind of Radar University in which J. A. Radcliffe, of Cambridge, and Dr. L. Huxley, of Nottingham, played a great part. There was also G. W. A. Dummer, whose fertile brain devised synthetic radar trainers, the use of which saved the R.A.F. £50,000,000 worth of aviation spirit, and many others whose names are too numerous to include here.

Satisfied Customer

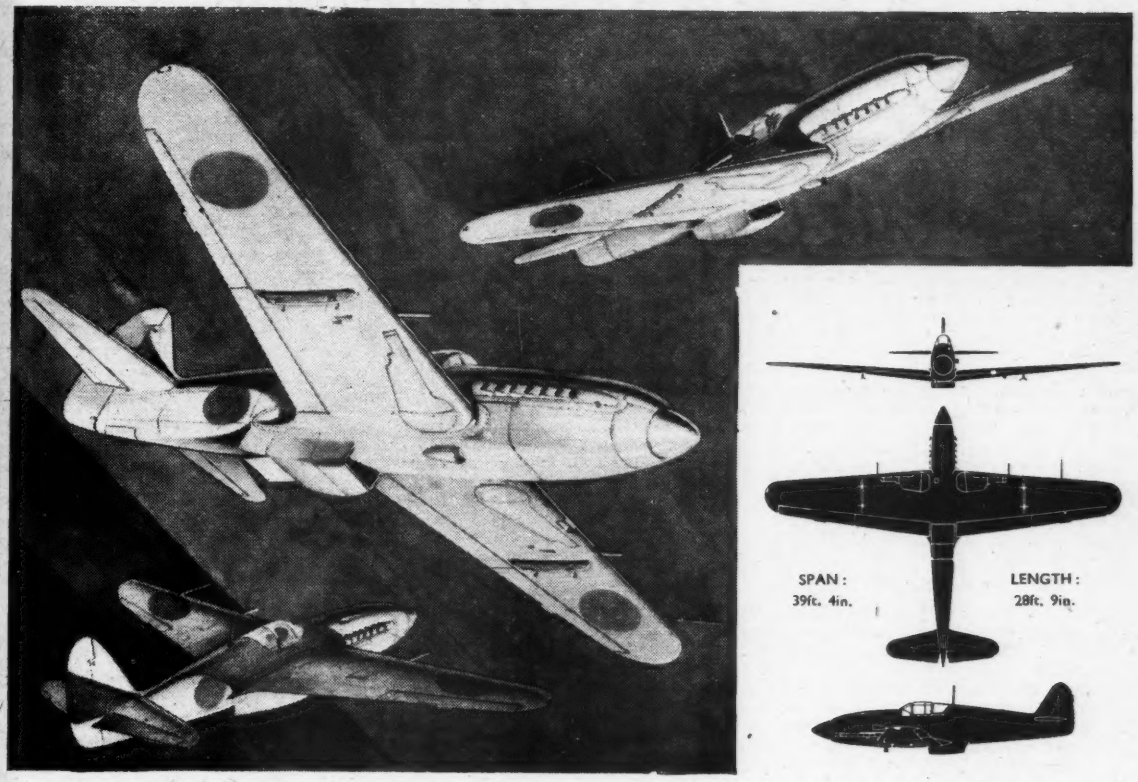
Air Chief Marshal Sir Arthur Tedder, whose culminating position in the war was that of Deputy Allied Supreme Commander in the European Theatre, was one of a number of senior Service officers attending the Press Conference, together with Sir Robert Watson-Watt and other scientists.

Sir Arthur, who said he was speaking of radar from the user's angle, told the conference that in his opinion the supreme example of the value of radar as a means of preventing surprise attacks was in the defence of Malta. Available fighter defence was down to "about one machine," and only the fact that radar gave them ample warning enabled them to use their limited defences in the most effective way instead of wasting them.

Again, enemy power in Libya and North Africa had been strangled in a large measure because airborne and shipborne radar enormously facilitated search, and so the German supplies were constantly being intercepted and

(*Concluded at bottom of p.* 211.)

MITSUBISHI S-03 "TONY"



IN LIQUIDATION: Three perspective sketches and official silhouettes of the Japanese single-seater fighter, "Tony," the only Pacific enemy of its type with a liquid-cooled, in-line V-type engine. Like the rest of the brood, it is now fortunately out of business.

ALTHOUGH officially designated the Mitsubishi S-03, the Japanese single-seater fighter known by the Pacific code name of "Tony" was actually produced by the Kawasaki firm, a member of the Mitsubishi combine which is Japan's most powerful commercial monopoly.

It was introduced in 1943—as indicated by the figures 03, the equivalent of '43 in the Japanese calendar—Tony broke new ground in Jap aircraft design by being the first service type to go into quantity production with a liquid-cooled, in-line, V-type engine, though he was eventually followed by the carrier-based navy bomber, Judy 22, in this respect.

The first examples of Tony were fitted with a 1,100 h.p. Kawasaki Type 2 engine, while Judy 22 had a 1,185 h.p. Atsuka 21 engine. Both were almost direct copies of the German Mercedes-Benz (or Daimler-Benz) inverted V units, and in later editions the horse-power was stepped up, in the case of the Atsuka to 1,380 h.p.

By the end of the war there were probably more Tony fighters in service with the Japanese Army Air Force than any other single type. The allocation of Tony to the Army instead of the Navy occasioned some surprise when this type first appeared because the Jap Navy was generally credited with having such a "pull" with the country's big industrialists that it generally managed to grab the pick of available aircraft. Tony's top speed is more than 360 m.p.h., rate of climb 2,400ft./min., and maximum range about 1,900 miles.

Three different armament arrangements have been encountered, namely, two 7.7 mm. and two 12.7 mm. machine-guns; two 12.7 mm. machine-guns and two 20 mm. cannon; or four 7.7 mm. machine guns. Additionally, two 220 lb. bombs were often carried. Tony was also notable among Jap fighters in providing armour protection for the pilot, leak-proof tanks, and protection for the radiator, bringing the all-up weight to round about 7,000 lb.

By virtue of its "German" nose, Tony is easily recognisable in most views, but when seen head-on it bears a disconcerting likeness to the Mustang because of the fairly deep radiator scoop amidships and the pronounced dihedral from the wing roots.

Radar *(Continued from previous page)*

did not often get through. The terrific slaughter of Rommel's Ju 52 transports was facilitated by radar.

In the bomber offensive radar was developed until Pathfinders were able to mark the target to within yards, and day bombers were able to identify and hit targets through continuous cloud-layers. Apart from the vital importance of accuracy and concentration in the final campaign, this reduced civilian casualties in occupied countries to an absolute minimum.

The final collapse of German communications was brought about during winter months when, without radar to defeat the weather, such speedy results would have been impossible.

The success in this battle of wits with the Germans, in which we were always one jump ahead, was due to the close team-work between the scientists and the user, between Britain, the Dominions and the U.S., and between all the fighting Services of the Allies.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

AIR POWER

It Has Now Won a War

THOSE who have put their trust in air power may now sit back and pat themselves on the back: for the first time in history an air weapon has more or less won a war. I consider that the sudden Jap peace moves were brought about 40 per cent. by the entry of the Russians and 60 per cent. by the atom bombs on Hiroshima and Nagasaki.

This does not mean that the steady "slogging" of the armies through Burma, and the "hopping" from one island to another was useless—far from it. Without their efforts no bases would have been available from which to transport this bomb to the enemy's lair.

The Japanese negotiations for peace only give me one cause for regret—we will not be able to prove that the Avro Lincoln is as good as (if not better than) the Superfortress.

To change the subject, may I thank *Flight* very sincerely for the words under the photograph of the Lockheed Shooting Star, pointing out that the D.H. Vampire is not lagging behind. I don't want to quarrel with America, but didn't the Shooting Star begin its career at 800 m.p.h.? Why is it now doing 550? I believe in publicity, but too many people believe these tales. The old advertisement, "Buy British, buy best," still holds good.

R. E. GREGORY.

Land-based or Carrier-based

HAVING written a good deal on the subject of "Battleships and Bombs," I was interested to read Lieutenant-Commander J. B. Hurren's "Analysis of Results" (*Flight*, August 2nd).

I fully agree with his statement of the urgent need to decide *now* how our defence budget is to be spent, and particularly how it is to be proportioned between aircraft and warships. This has been an urgent question for about twenty years. It is possible that if the millions spent on the *Prince of Wales* and *Repulse* had been used instead to build up a system of air defence for Northern Australia and Singapore, the Japanese invasion of that part of the world might never have succeeded.

The conclusion that sea-based air-power is not inferior to land-based air-power, seems, however, to be based on false premises. Lieutenant-Commander Hurren admits, apparently, that the carrier-borne Hellcat is inferior to, say, the Spitfire, Tempest, Mustang or Thunderbolt; and he says that in spite of this, carrier-borne raids have been successfully made over the heart of Japan.

This can only be admitted as proof of his theory if we also admit that the Japanese aircraft and pilots are the equal of our own, *and* that they are still at the height of their power.

The Japanese war was a useful guide in making our decision on air-power, but it is likely to be an unbalanced decision unless we also ask ourselves: "Could we have succeeded in such a carrier-borne attack against the *Luftwaffe* at its best?"

E. N. B. BENTLEY (A.F.R.Ae.S.).

AIR TRAVEL

Comparative Costs

I THINK it is generally agreed that the lay Press is often "lacking" when it comes to deal with aviation.

With all due respect to Mr. Peter Masefield, it seems that this still applies occasionally, even when the writer concerned is of known repute.

In the C.M.F. Army newspaper *Crusader* of July 22nd, Mr. Masefield writes, in an otherwise excellent article on air transport:—

"Our first aim must be to equal in the air—by technical progress and not by subsidy—the cost of first-class travel by other means of transport. That aim has been achieved on some routes already. On others much still remains to be done. Even when it is achieved everywhere the results will still not be good enough, because air travel for six hours will still cost us much more than rail or sea travel would for an equal time. What we want to do—what must be our technical aim—is to (this is in italics in the article) *make a six-hour journey by air as cheap as a six-hour journey by train (first class).*"

In other words, the cost of travelling from London to Edinburgh by train would be the same as that for air travel from London to Cairo.

One wonders who would be travelling on the railways in such circumstances! It appears that Mr. Masefield has based this statement on the relative "efficiency" figure of aircraft compared with the steam locomotive or steamship.

Exactly what such theoretical reasonings are worth is a debatable point, but it would seem that the paragraph quoted is hardly the type of writing best suited to introduce the Army to the whys and wherefores of air transport.

"DOUGLAS DEANS."

MORE SPACE WANTED

Existing Facilities Wasted

IT was with some satisfaction that I read "Indicator's" article, "More Space Wanted," in *Flight*, August 2nd. All the difficulties that "Indicator" mentions, which aircraft manufacturers may have to face, are non-existent at one big plant in the North-west. Yet this factory, built before the war alongside Liverpool Airport, and one of the biggest aircraft plants in the country, has ceased its legitimate work and is now to be used making rubber goods!

It is high time that a bit more common sense was used by those responsible for the re-allocation of Government war plants. Surely they could make rubber clothing, tennis balls, tyres, etc., in one of the hundreds of munition factories located in areas far from any airfields, and so avoid the utter waste of national aircraft-manufacturing capacity.

W. G. ROBERTS.

R.O.C.

Fate of "B" Category Observers

AS late members of the R.O.C., we pen this letter in the hope that its publication might encourage the authorities concerned to make some statement as to the ultimate fate of that body.

We say "late members" because, although we signed on, or rather volunteered, for further possible duty (unpaid) in the future, our dismissal at almost a moment's notice ("B" category, of course) has given us the impression that authority is now no longer interested in our future activities. Nothing further has been heard since we were disbanded, and even the *Inter-Services Journal* is now denied us.

Although we have no quarrel with "A" personnel as such, we fail to see the reason for the apparent discrimination that is shown between "A" and "B" categories, who, after all, were both doing the same job.

Further, it would seem that, from information obtainable, the recent rally for the R.O.C. at North Weald was attended in the majority by officers, head and leading observers, master spotters and seaborne personnel. We have even been informed that participants from one group were limited to leading ranks and officers.

While we fully appreciate that it would have been impossible for every observer to have been invited, we do feel that group rallies could have been arranged to give the ordinary observer at least a chance to see the R.A.F. at closer quarters than "zero 100." Surprising as it may seem, there are still many observers who are keen and interested enough to continue the acquisiton of aeronautical knowledge.

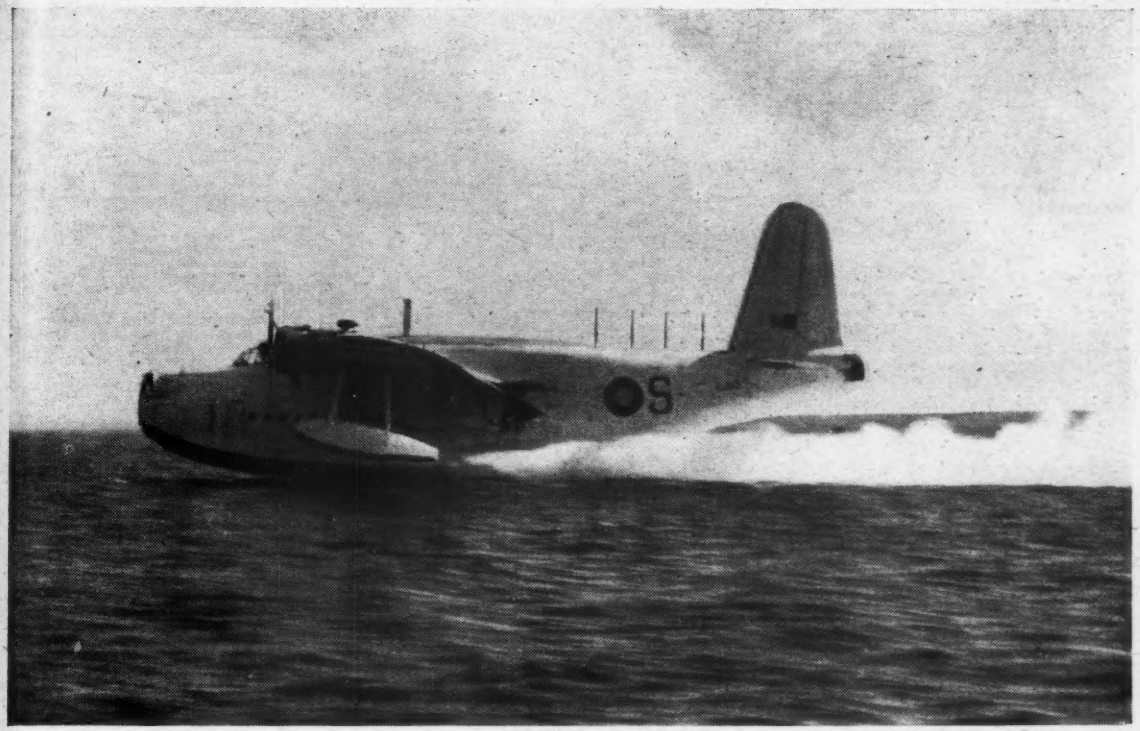
It might be of interest to add that, despite nearly two years' service in the corps, not once were the undersigned permitted, or even given an opportunity, to visit an R.A.F. station, let alone given the chance to inspect captured enemy aircraft. This despite the fact that we served in one of the busiest groups both for friendly and hostile types, and much concern was shown if we failed to obtain full marks in every monthly recognition test.

To cap all, we have just learned that a display of aircraft and flying is to be provided for our group, which, however, is restricted to "A" personnel from Centre only.

It seems, therefore, that while authority was very concerned about our efficiency a few short months ago, there now appears to be a complete reversal of policy.

We suppose that the retort we shall receive to this somewhat lengthy (but, in our opinion, justified) grouse is that mechanical weapons of the V2 type will now make the R.O.C. as such obsolescent.

"TWO VERY BROWNED-OFF EX-P.B.O.s."



CORAL ISLAND BASE: An R.A.F. Sunderland takes off from the lagoon of Diego Garcia island, one of three island bases in the Maldive group of the Indian Ocean.

SERVICE AVIATION

Royal Air Force and Naval Air Arm News and Announcements

Appointments

THE Air Ministry announces the following R.A.F. appointments:—

Air Vice Marshal S. C. STRAFFORD, C.B., C.B.E., D.F.C., to be Air Officer Commanding, Royal Air Force, Iraq.

Air Vice Marshal V. E. GROOM, C.B., C.B.E., D.F.C., to be Air Officer in Charge of Administration, Flying Training Command.

Air Vice Marshal G. S. HODSON, C.B.E., A.F.C., to be Air Officer in Charge of Training, Bomber Command.

Air Vice Marshal Strafford has been Air Officer in charge of Administration at Headquarters, Middle East, since December last, having been from the previous June Chief of Operations and Plans, Headquarters, Allied Expeditionary Air Force, where he had been on air staff planning duties since November, 1943, following a few months on air staff duties at the Air Ministry. From June, 1941, he was for two years Director of Plans, Royal Air Force Delegation, Washington. Early in the war he commanded a detachment of the Advanced Air Striking Force in France. From July to December, 1940, he was Officer in Charge of Operations Room, General Headquarters, Home Forces, and was then posted to the Directorate of Plans at the Air Ministry.

Air Vice Marshal Groom was Senior Air Staff Officer, Second Tactical Air Force, from September, 1943, until its dissolution last month. He served during 1942 and 1943 on the special planning staff at the Air Ministry and on air staff planning duties at Headquarters, Fighter Command, prior to which, in 1941, he was attached to the Directorate of Plans Deparment, Chief of Air Staff, for duty in joint planning. For some months in 1940 and 1941 he commanded R.A.F. Station, Markham, after serving at Headquarters, Bomber Command, from 1936 to 1940 on air staff and operational duties in turn.

Air Vice Marshal Hodson has been Air Officer Commanding, No. 92 Group, Bomber Command, since February, prior to which he had been A.O.C., two other Groups in turn from August, 1944. Earlier in 1944 he commanded No. 44 Base, having commanded R.A.F. Station Holme from June, 1943. Before that he was on interchange duty with the Royal New Zealand Air Force from the beginning of 1938.

Awards

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations.

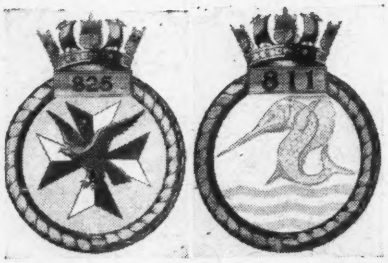
Distinguished Service Order

Sqn. Ldr. C. H MUSSELLS, R.C.A.F., No. 405 (R.C.A.F.) Sqn.—In April, 1945, this officer piloted an aircraft in an attack against Leipzig. Just after making his first run over the target the aircraft was attacked by an enemy fighter and sustained serious damage. The rear turret and the starboard rudder were shot away. The port rudder was smashed and both elevators were badly damaged. The aircraft dived out of control. As Sqn. Ldr. Mussells fought to regain control he found that the trimming controls were useless. Nevertheless, he succeeded in levelling out after considerable height had been lost. To keep the nose of the aircraft up the control column had to be lashed back. In circumstances of the greatest difficulty, Sqn. Ldr. Mussells flew the crippled aircraft back to this country. After crossing the English coast he ordered his crew to abandon the aircraft and, with the exception of the mid-upper gunner, who was seriously wounded, they left by parachute. Sqn. Ldr. Mussells flew on to the nearest airfield with his wounded comrade. With the control column still lashed back, and without the aid of flaps, this officer showed superb skill in bringing the crippled aircraft down safely. Throughout a most trying experience he displayed the highest qualities of leadership, skill and courage. His example was outstanding.

Wing Cdr. F. G. GRANT, D.F.C., R.C.A.F.—Since the award of the D.F.C. this officer has continued to display brilliant leadership and outstanding courage on all types of operations. He has led the Wing in all the major actions during the Ardennes battles and, despite the fierce opposition encountered, has pressed home attack after attack with great skill and courage. During the Rhine crossing, Wing Cdr. Grant organised and led the operations of the wing, which was employed against the enemy's anti-aircraft defences in support of the airborne landings. By his skill and daring many enemy gun positions were silenced. In the subsequent drive across Germany he led many sorties in direct support of the army, contributing materially to the rapid advances of the land forces. The great success achieved by his wing has been directly attributable to Wing Cdr. Grant's exceptional skill and outstanding leadership.

Wing Cdr. R. C. A. WADDELL, D.F.C., R.C.A.F.—The success achieved by his wing while engaged on photographic duties has been largely owing to the careful planning and leadership of Wing Cdr. Waddell. During the past twelve months the wing has operated extensively over heavily defended first line positions and deep in enemy territory. All of these sorties have required most careful and detailed planning, and all of them have been executed either under the personal leadership of Wing Cdr. Waddell or under his direct supervision. Prior to the Rhine crossings this officer flew on a number of very low level sorties, photographing roads and communications between the Rhine and the Elbe. On every occasion, despite intense anti-aircraft fire, he obtained photographs of excellent quality, which were of the greatest value to the 2nd Army in planning their successful attack.

Act. Wing Cdr. J. J. K. FLEETWOOD, R.A.F., No. 86 Sqn.—This officer commenced operational work in October, 1939, when he took part in anti-submarine patrols, escort duties and attacks on enemy shipping off the Dutch and Norwegian coasts. During his first tour of duty he assisted in rescuing survivors and, later, in locating the prison ship "Altmark" off the Norwegian coast. In November, 1940, Wing Cdr. Fleetwood led a



(Left) Badge of No. 825 Squadron, Naval Air Arm. "Nihil Obstat" (Nothing Stops Us). On a blue field, a Maltese Cross, each arm per pale red and white surmounted by an eagle rising proper. (Right) Badge of No. 811 Squadron, Naval Air Arm. "Ventre a Mer" (Full Speed). On a white field, a swordfish over a base barry wavy of 6 blue and white.

formation of eight aircraft on the first bombing raid on Bremen. This sortie was completed successfully, despite extreme difficulties. Since February, 1944, this officer has operated as flight and subsequently squadron commander. He has completed many Atlantic convoy escorts and anti-submarine patrols, and has always displayed outstanding courage and sustained devotion to duty. Under his leadership his present squadron was successfully converted to the operation of the Leigh Light, and has achieved an excellent record in this activity. Wing Cdr. Fleetwood has proved himself an excellent squadron commander. He has never spared himself in the interests of duty, and much of the success achieved has been owing to his untiring efforts.

Act. Wing Cdr. H. H. C. HOLDERNESS, D.F.C., A.F.C., R.A.F.V.R., No. 502 Sqn.—Wing Cdr. Holderness has commanded his squadron for a considerable period. He has taken part in many of the sorties completed by the squadron. These have been mainly anti-shipping patrols over the Bay of Biscay and the Atlantic. In October, 1944, Wing Cdr. Holderness attacked an enemy vessel in the Skagerrak, and in November, 1944, he bombed a beached U boat. He has completed many other attacks on enemy ships, some of them in the face of intense opposition. As a pilot and as squadron commander this officer has always displayed outstanding determination, leadership and courage.

Flt. Lt. H. J. COBB, D.F.C. R.A.F.V.R., No. 524 Sqn.—Since the award of the D.F.C. Flt. Lt. Cobb has continued to display the utmost gallantry and skill in attacks on enemy shipping. In September, 1944, he completed an effective attack on merchant shipping in Wilhelmshaven Anchorage. Concentrated anti-aircraft fire was encountered, but the ships were accurately bombed, the largest being left on fire. On other occasions he has operated successfully against enemy shipping and E boats, pressing home his attacks with unfailing courage and skill, frequently in the face of intense opposition. This captain of aircraft has always flown with great coolness, even in the most adverse weather. In March, 1945, on returning from a nine hours' patrol, he found visibility at base very poor. In spite of this he executed a perfect landing at the first attempt. His record of courage and flying skill have earned him an outstanding reputation, and he has set a magnificent example.

Act. Sqn. Ldr. P. E. VAUGHAN-FOWLER, D.F.C., R.A.F.V.R., No. 213 Sqn.—This officer is a skilful and courageous pilot. He has completed a very large number of sorties against a variety of targets, and his determination and great keenness have materially assisted his squadron in maintaining their high standard of morale. Despite extremely adverse weather and damage to his aircraft, Sqn. Ldr. Vaughan-Fowler has made many attacks against mechanical transport vehicles, locomotives and shipping, with a high degree of success. Much damage was inflicted on the enemy. This officer is a fine leader whose example has been well reflected in the operational efficiency of the squadron he commands.

Act. Wing Cdr. A. WHARTON, D.F.C., R.A.A.F., No. 466 (R.A.A.F.) Sqn.—This officer has proved himself a most courageous and efficient pilot and squadron commander. He has taken part in numerous operational missions, and has led his squadron with success against many of the major targets in enemy territory. As commander of his squadron, Wing Cdr. Wharton has been largely responsible for its high standard of efficiency and keenness. Both in the air and on the ground he has given untiring and conscientious service.

Act. Wing Cdr. C. H. BAIGENT, D.F.C., R.N.Z.A.F., No. 75 Sqn.—Throughout three tours of operational duty this officer has displayed conspicuous gallantry and exceptional determination. Since the award of a Bar to the D.F.C. he has taken part in many attacks against important and highly defended targets. Both in the air and on the ground Wing Cdr. Baigent has proved to be an able, keen and courageous leader, who has invariably set an inspiring example to all under his command.

Act. Sqn. Ldr. W. G. FINLAY, D.F.C., R.N.Z.A.F., No. 109 Sqn.—This officer has had a most distinguished operational career. He has been engaged on flying duties since early in the war, and has participated in attacks on a great variety of targets, many of which were heavily defended industrial centres in Germany. Since the award of the D.F.C. Sqn. Ldr. Finlay has taken part in numerous sorties, and has fulfilled his tasks with outstanding efficiency and accuracy. Whatever the opposition he has invariably delivered his attack with precision and the utmost coolness. His work, both on the ground and in the air, has left nothing to be desired.

Act. Flt Lt. G. A. THORNE, D.F.C., R.A.F.V.R., No. 635 Sqn.—In April, 1945, this officer piloted an aircraft in an attack against Nuremburg. In the run-up to the target, Flt. Lt. Thorne's aircraft was hit. The port aileron was affected and the aircraft became difficult to control. In spite of this, Flt. Lt. Thorne made several runs over the target to ensure an accurate attack. He afterwards flew the damaged aircraft to base, where he effected a safe landing. This officer, who has completed very many sorties since being awarded the D.F.C., and never failed to complete his allotted task, displayed the highest standard of devotion to duty throughout.

F/O. A. C. BELFORD, No. 463 (R.A.A.F.) Sqn.—In March, 1945, this officer was pilot and captain of an aircraft detailed to attack an oil refinery at Bohlen. When over the target the aircraft was hit by anti-aircraft fire. The starboard aileron was shot away, the rear spar was almost severed, while one of the petrol tanks was blown out of the wing. A large hole was torn in the fuselage. The elevators, rudders and fins were also hit. The aircraft rolled over to starboard out of control. Although F/O. Belford warned his crew to be ready to abandon, he remained at the controls. Much height was lost, but this resolute pilot finally succeeded in regaining a measure of control. He thereupon decided to try to fly the crippled aircraft home. Some time later he became aware that two members of his crew had been badly wounded. F/O. Belford then altered course for an airfield in allied territory, where he made a successful landing under circumstances of great difficulty at the second attempt. On this sortie, F/O. Belford displayed the highest qualities of skill, superb captaincy and exceptional resolution. He has completed very many operational missions, and throughout his devotion to duty has been unswerving.

FAREWELL TO CZECHS: Air Marshal Sir John Slessor inspects some of the Czech pilots just before they returned home to Czechoslovakia.

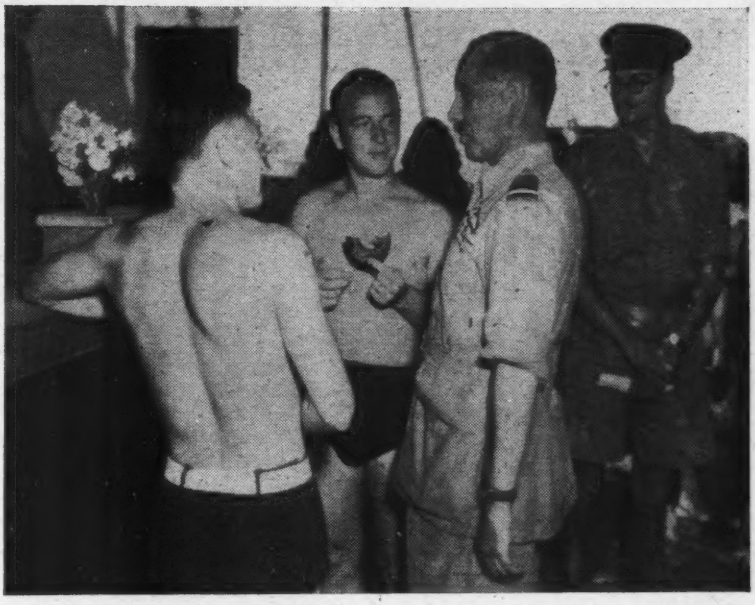
SERVI

Distinguished Flying Cross

Flt. Lt. B. L. GARNER, R.A.F.V.R., No. 92 Sqn.
Flt. Lt. D. L. S. WOOD, R.A.F.V.R., No. 145 Sqn.
Capt. F. E. POTGIETER, S.A.A.F., No. 3 (S.A.A.F.), Sqn.
Capt. G. W. SCHWIKKARD, S.A.A.F., No. 112 Sqn.
Capt. L. E. A. SHAW, S.A.A.F., No. 450 (S.A.A.F.) Sqn.
F/O. T. F. FORD, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Capt. W. B. TILLEY, S.A.A.F., No. 680 Sqn.
Lt. L. A. N. DOWN, S.A.A.F., No. 250 Sqn.
Lt. C. J. FRANKEN, S.A.A.F., No. 19 (S.A.A.F.) Sqn.
Lt. L. B. JULYAN, S.A.A.F., No. 18 Sqn.
Lt. I. E. F. KIRBY, S.A.A.F., No. 114 Sqn.
Lt. H. J. KRITZINGER, S.A.A.F., No. 1 (S.A.A.F.) Sqn.
Lt. W. W. WITHERDEN, S.A.A.F., No. 24 (S.A.A.F.) Sqn.
Capt. G. GARLICK, S.A.A.F., No. 250 Sqn.
Flt. Lt. K. D. VAUGHAN, R.A.F.V.R., No. 85 Sqn.
F/O. C. J. SHEDDAN, R.N.Z.A.F., No. 486 (N.Z.) Sqn.
Lt. R. H. VEITCH, S.A.A.F., No. 260 Sqn.
Flt. Lt. R. S. N. BROWN, R.A.F.V.R., No. 260 Sqn.
Flt. Lt. N. C. H. TUFNELL, R.A.F.V.R., No. 225 Sqn.
Act. Flt. Lt G. L. HIRONS, R.A.F.V.R., No. 112 Sqn.
P/O. R. W. BAIN, R.A.A.F., No. 357 Sqn.
P/O. W. G. PETLEY, R.A.A.F., No. 357 Sqn.
Flt. Lt. J. I. JACKSON, R.C.A.F., No. 160 Sqn.
F/O. D. F. BONNELL, R.C.A.F., No. 11 Sqn.
P/O. D. H. A. MCKAY, R.C.A.F., No. 417 (R.C.A.F.) Sqn.
Sqn. Ldr. J. M. CRANSTONE, R.N.Z.A.F., No. 5 Sqn.
F/O. T. W. PARKER, R.N.Z.A.F., No. 614 Sqn.
F/O. W. T. H. FLECKNEY, R.A.F., No. 614 Sqn.
F/O. R. W. PEACOCK, R.A.F.V.R., No. 27 Sqn.
P/O. E. C. D COLTON, R.A.F.V.R., No. 11 Sqn.
P/O. G. H. R. SLADE, R.A.F.V.R., No. 614 Sqn.
W/O. W. G. MURRAY, R.A.F.V.R., No. 357 Sqn.
W/O. R. W. H. NARRAMORE, R.A.F.V.R., No. 570 Sqn.
W/O. W. D. SEWELL, R.A.F.V.R., No. 27 Sqn.
Flt. Lt. E. R. ROBERTSON, R.A.F.V.R., No. 60 Sqn.
Flt. Lt. G. STEVENS, R.A.F.V.R., No. 684 Sqn.
Act. Flt. Lt. F. G. BRACE, R.A.F.V.R., No. 19 (S.A.A.F.) Sqn.
Act. Flt. Lt. H. H. COLE-BAKER, R.A.F.V.R., No. 18 Sqn.
Act. Flt. Lt. H. F. COOPER, R.A.F.V.R., No. 27 Sqn.
F/O. C. D BRINDED, R.A.F.V.R., No. 27 Sqn.
F/O. M. H. BUNN, R.A.F.V.R., No. 27 Sqn.
Act. Sqn. Ldr. D. C. NICHOLL, R.A.F.V.R., No. 27 Sqn.
Act. Sqn Ldr. H. SCOTT, R.A.F.V.R., No. 644 Sqn.
Flt. Lt. C. E. BRAYSHAW, R.A.F.V.R., No. 27 Sqn.
Flt. Lt. J. COTTER, R.A.F.V.R., No. 27 Sqn.
Flt. Lt. G. R. ELLIOTT, R.A.F.V.R., No. 272 Sqn.
Flt. Lt. W. M. HOUSE, R.A.F.V.R., No. 27 Sqn.
Flt. Lt. P. W. BOWLES, R.A.A.F., No. 357 Sqn.
Flt. Lt. A. H. DE MILLE, R.C.A.F., No. 576 Sqn.
Flt. Lt. J. S. MILLINGTON, R.A.F.V.R., No. 524 Sqn.
Act. F/O. S. ABEL, R.A.F.V.R., No. 514 Sqn.
P/O. K. V. JOHNSON, R.A.F.V.R., No. 241 sqn.
P/O. L. KNIGHT, R.A.F.V.R., No. 625 Sqn.
Flt. Lt. D. J. T. HAMM, R.C.A.F., No. 409 (R.C.A.F.) Sqn.
F/O. E. E. HERMANSON, R.C.A.F., No. 409 (R.C.A.F.) Sqn.
Act. Flt. Lt. B. DAVIES, R.A.F.V.R., No. 10 Sqn.
Capt. E. D. THOMPSON, S.A.A.F., No. 33 Sqn.
P/O. R. TIBBLE, R.A.F.V.R., No. 13 Sqn.
W/O. L. K. KEVAN, R.A.F.V.R., No. 680 Sqn.
Maj. D M. CADLE, S.A.A.F., No. 12 (S.A.A.F.) Sqn.
Maj. E. E. C. WOODS, S.A.A.F., No. 24 (S.A.A.F.) Sqn.
Capt. B. N. ACKERMANN, S.A.A.F., No. 3 (S.A.A.F.) Sqn.
Capt. R. H HUBBARD, S.A A.F., No. 16 (S.A.A.F.) Sqn.
Capt. G. W. SUMMER, S.A.A.F., No. 4 (S.A.A.F.) Sqn.
Act. Wing Cdr. W. E. M. LOWRY, R.A.F., No. 684 Sqn.
Act Wing Cdr. A. E. NEWITT, R.A.F., No. 148 Sqn.
Act. Sqn. Ldr. P. A. FRIEND, R.A.F.V.R., No. 680 Sqn.

...IATION

Sqn. Ldr. A. J. RADCLIFFE, R.A.A.F., No. 241 Sqn.
F/O. C. B. RACICOT, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. G. E. REYNOLDS, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. J. D. DERRY, R.A.F.V.R., No. 182 Sqn.
Maj. H. E. WELLS, S.A.A.F., No. 72 Sqn.
Flt. Lt. I. R. PONSFORD, R.A.F.V.R., No. 130 Sqn.
Flt. Lt. R. G. C. RUSSELL, R.A.F.V.R., No. 241 Sqn.
Flt. Lt. W. R. AUSTIN, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
Flt. Lt. J. D. C. CRATON, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. A. B. GILES, R.A.A.F., No. 355 Sqn.
F/O. T. E. SCOTLAND, R.A.A.F., No. 614 Sqn.
Act. Wing Cdr. I. M. GUNDRY-WHITE, R.A.F.O., No. 101 Sqn
Sqn. Ldr. T. J. DE COURCY, R.C.A.F., No. 443 (R.C.A.F.) Sqn.
Flt. Lt. J. R. ALVERSON, R.C.A.F., No. 357 Sqn.
F/O. L. MURPHY, R.A.F.V.R., No. 235 Sqn.
F/O. E. P. TAYLOR, R.N.Z.A.F., No. 489 (N.Z.) Sqn.
W/O. J. C. AYLIFFE, R.A.A.F., No. 455 (R.A.A.F.) Sqn.
W/O. B. G. GORDON, R.A.F.V.R., No. 489 (N.Z.) Sqn
W/O. N. P. TURNER, R.A.A.F., No. 455 (R.A.A.F.) Sqn.
W/O. I. M. GORDON, R.A.A.F., No. 455 (R.A.A.F.) Sqn.
W/O. C. D. HUDSON, R.A.F., No. 203 Sqn.
Act. Wing Cdr. T. C. MUSGRAVE, O.B.E., R.A.F.O., No. 296 Sqn.
Act. Sqn. Ldr. P. J. HEARNE, R.A.F.V.R., No. 19 Sqn.
Flt. Lt. G. R. BRADFORD, R.C.A.F., No. 212 Sqn.
Flt. Lt. M. SHNIDER, R.C.A.F., No. 212 Sqn.
Flt. Lt. H. LANNING, R.A.F., No. 644 Sqn.
Act. Sqn. Ldr. S. R. HYLAND, A.F.C., R.A.F., No. 236 Sqn.
Flt. Lt. G. F. BROWNE, R.A.F.V.R., No. 143 Sqn.
Flt. Lt. K. N. CLARK, R.A.F.V.R., No. 502 Sqn.
W/O. F. T. CORNISH, R.A.F.V.R., No. 236 Sqn.
W/O. J. D. NICOL, R.A.F.V.R., No. 86 Sqn.
W/O. R. S. PRIEST, R.N.Z.A.F., No. 489 (N.Z.) Sqn.
Act. Sqn. Ldr. W. H. R. JONES, R.A.F.V.R., No. 236 Sqn.
Act. Sqn. Ldr. N. WILLIAMSON, R.A.F.V.R., No. 119 Sqn.
Flt. Lt. R. J. FOWLER, R.A.F.V.R., No. 524 Sqn.
Flt. Lt. G. GRAY, R.A.F.V.R., No. 524 Sqn.
Sqn. Ldr. G. J. STONHILL, R.A.F., No. 154 Sqn.
Flt. Lt. W. J. BATCHELOR, R.A.F.V.R., No. 603 Sqn.
Flt. Lt. R. J. G. DAVIDSON, R.A.F.V.R., No. 190 Sqn.
Flt. Lt. D. H. JONES, R.A.F.V.R., No. 620 Sqn.
F/O. R. S. MIDDLETON, R.C.A.F., No. 190 Sqn.
P/O. J. B. MUTTON, R.C.A.F., No. 298 Sqn.
W/O. H. DIPPLE, R.A.F.V.R., No. 502 Sqn.
W/O. S. W. KING, R.A.F.V.R., No. 502 Sqn.
W/O. J. G. H. MURPHY, R.A.F.V.R., No. 144 Sqn.
Flt. Lt. J. K. DAVENPORT, R.A.F.V.R., No. 502 Sqn.
Flt. Lt. A. A. MCINTOSH, R.A.F.V.R., No. 248 Sqn.
Flt. Lt. F. J. MAIR, R.C.A.F., No 502 Sqn.
F/O. R. HAYNES, R.A.F.V.R., No. 502 Sqn.
F/O. S. J. CONNELL, R.A.A.F., No. 190 Sqn.
Flt. Lt. N. LEVITEN, R.C.A.F., No. 212 Sqn.
F/O. J. O. L. DESBOCHES, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
Act. Wing Cdr. J. B. NICHOLLS, R.A.A.F., No. 35 Sqn.
Act. Sqn. Ldr. H. R. LEDINGHAM, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Flt. Lt. P. K. DEANE, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
Flt. Lt. J. L. STORMS, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Flt. Lt. W. M. WALKER, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Act. Flt. Lt. A. D. COOK, R.A.F.V.R., No. 625 Sqn.
Lt. C. C. BFATTIE, S.A.A.F., No. 31 (S.A.A.F.) Sqn.
W/O. H. R. ANDERSEN (later P/O.), R.A.F.V.R., No. 156 Sqn. (since deceased).
Flt. Lt. W. K. WATTS, R.A.A.F., No. 3 Sqn.
F/O. L. A. SEYMOUR, R.A.A.F., No. 18 Sqn.
Flt. Lt. G. S. PEARSON, R.A.F.V.R., No. 65 Sqn.
Act. Flt. Lt. F. D. MOSS, R.A.F.V.R., No. 10 Sqn.
F/O. L. BROOKES, R.A.F., No. 240 Sqn.
Act. F/O. D. L. WOOD, R.A.F.V.R., No. 158 Sqn.
P/O. J. H. COLE, R.A.F.V.R., No. 644 Sqn.
W/O. W. J. WALSH, R.N.Z.A.F., No. 158 Sqn.
Flt. Lt. W. H. FULTON, R.C.A.F., No. 236 Sqn.
Flt. Lt. R. H. GOLIGHTLY, R.A.F.V.R., No. 333 Sqn.
Flt. Lt. K. J. HIRSH, R.A.F., No. 55 Sqn.
Flt. Lt. M. C. KAY, R.A.F.V.R., No. 86 Sqn.
Capt. W. E. COLAHAN, S.A.A.F., No. 72 Sqn.
F/O. J. G. COX, R.A.A.F., No. 455 (R.A.A.F.) Sqn.
F/O. G. J. DALY, R.A.F.V.R.
F/O. B. GIBSON, R.A.F.V.R., No. 93 Sqn.
F/O. P. F. SOUTHERNWOOD, R.N.Z.A.F., No. 489 (R.N.Z.A.F.) Sqn.
Lt. P. J. LAGESEN, S.A.A.F., No. 31 (S.A.A.F.) Sqn.



ROME REST-CAMP: Air Marshal Sir A. G. R. Garrod, K.C.B., O.B.E., M.C., D.F.C., C.-in-C. Mediterranean and Middle East, recently visited R.A.F. leave and transit centres in the Rome area. He is seen here talking with two airmen in the swimming pool of No. 15 Rest and Leave Camp, Rome.

Lt. S. J. TREZISE, S.A.A.F., No. 31 (S.A.A.F.) Sqn.
P/O. L. HOPWOOD, R.A.F.V.R., No. 254 Sqn.
Flt. Lt. L. P. LIGHT, R.A.F.V.R., No. 299 Sqn.
Flt. Lt. J. H. WETHERLY, R.A.F.V.R., No. 76 Sqn. (since deceased).
Flt. Lt. D. B. WILLS, R.A.F.V.R., No. 68 Sqn.
F/O. J. O. YOUNG, R.A.F.V.R., No. 106 Sqn. (since deceased).
Act. Flt. Lt. D. H. HAYCOCK, R.A.F.V.R., No. 15 Sqn. (since deceased).
F/O. A. B. MARSH, R.A.F.V.R., No. 156 Sqn. (since deceased).
P/O. T. W. CHALLONER, R.A.F., No. 161 Sqn. (since deceased).
P/O. K. TAYLOR, R.A.F., No. 307 Sqn.
P/O. N. W. B. BRADY, R.A.A.F., No. 215 Sqn.
Flt. Lt. J. D. W. CAMPBELL, R.C.A.F., No. 119 Sqn.
F/O. J. H. SMITH, R.C.A.F., No. 612 Sqn.
Lt. R. BRIGGS, S.A.A.F., No. 249 Sqn.
Lt. B. J. G. KEYTER, S.A.A.F., No. 2 (S.A.A.F.) Sqn.
Act. Flt. Lt. P. J. TUHILL, R.A.F.V.R., No. 143 Sqn.
F/O. D. H. BENISTON, R.A.F.V.R., No. 224 Sqn.
F/O. P. C. KIIMISTER, R.A.F.V.R., No. 235 Sqn.
F/O. H. J. RICHARDSON, R.A.F.V.R., No. 540 Sqn.
P/O. A. G. SHINGLES, R.A.F.V.R., No. 544 Sqn.
P/O. C. D. SMITH, R.A.F.V.R., No. 544 Sqn.
Flt. Lt. N. B. MERRINGTON, R.A.F.V.R., No. 224 Sqn.
Flt. Lt. R. H. TAYLOR, R.A.F.V.R., No. 12 Sqn.
Flt. Lt. P. A. TOWNSHEND, R.A.F.V.R., No. 502 Sqn.
Flt. Lt. J. A. M. WEATHERILL, R.A.F.V.R., No. 544 Sqn.
Flt. Lt. J. C. WEBB, R.A.F.V.R., No. 544 Sqn.
Flt. Lt. A. L. WILLIAMS, R.A.F.V.R., No. 235 Sqn.
Flt. Lt. V. H. J. LE GEAR, R.C.A.F., No. 439 (R.C.A.F.) Sqn.
Flt. Lt. D. L. STEVENSON, R.A.F.V.R., No. 184 Sqn.
F/O. J. A. LAW, R.A.F.V.R., No. 203 Sqn.
F/O. C. F. WORSLEY, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Lt. J. W. SCHLEBUSCH, S.A.A.F., No. 184 Sqn.
P/O. A. K. BROWN, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
F/O. P. A. BLACK, R.A.A.F., No. 357 Sqn.
F/O. J. H. DUNK, R.A.A.F., No. 66 Sqn.
F/O. G. MCI. HUGHES, R.A.A.F., No. 354 Sqn.
F/O. C. R. WILLIAMS, R.A.A.F., No. 61 Sqn.
Act. Sqn. Ldr. M. D. BOYD, R.C.A.F., No. 412 (R.C.A.F.) Sqn.
Flt. Lt. W. H. BROWN, R.C.A.F., No. 407 (R.C.A.F.) Sqn.
Flt. Lt. R. H. CULL, R.C.A.F., No. 401 (R.C.A.F.) Sqn.
Flt. Lt. J. B. CONLIN, R.C.A.F., No. 107 Sqn.
Flt. Lt. J. D. INCHES, R.C.A.F., No. 609 Sqn.
Flt. Lt. R. W. MACDONALD, R.C.A.F., No. 418 (R.C.A.F.) Sqn.
Flt. Lt. A. M. NICOL, R.C.A.F., No. 418 (R.C.A.F.) Sqn.
Flt. Lt. E. G. SMITH, R.C.A.F., No. 107 Sqn.
F/O. J. DUGGAN, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
F/O. D. R. SAUNDERS, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
F/O. W. G. TOMKINS, R.A.F.V.R., No. 292 Sqn.
P/O. F. A. STEVENS, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
P/O. R. S. STOWE, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
P/O. E. N. WILLIAMS, R.C.A.F., No. 158 Sqn.
P/O. R. G. CLARKE, R.C.A.F., No. 90 Sqn.
W/O.2 P. L. GATES, R.C.A.F., No. 12 Sqn.
W/O.1 C. H. JACK, R.C.A.F., No. 35 Sqn.
W/O. L. J. MITCHELL, R.C.A.F., No. 433 Sqn.
W/O.2 G. A. SUTHERLAND, R.C.A.F., No. 35 Sqn.
W/O.2 J. J. WILLIAMS, R.C.A.F., No. 90 Sqn.
Act. F/O. R. A. A. MERLIN, R.C.A.F.
Act. Sqn. Ldr. R. RAJARAM, R.I.A.F., No. 1 (I.A.F.) Sqn.
Act. Flt. Lt. M. S. PUJJI, R.I.A.F., No. 4 (I.A.F.) Sqn.
P/O. J. K. MACDIARMID, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
P/O. K. F. MCCALLUM, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
P/O. J. A. MACGREGOR, R.C.A.F., No. 156 Sqn.
P/O. L. J. PLOTKINS, R.C.A.F., No. 625 Sqn.
P/O. J. W. POLLOCK, R.C.A.F., No. 156 Sqn.
P/O. L. ROBINSON, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
P/O. D. RUNCIMAN, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
P/O. C. A. SPEARING, R.C.A.F., No. 405 Sqn.
F/O. L. S. DREW, R.A.F.V.R., No. 514 Sqn.

(Left) Badge of No. 803 Squadron, Naval Air Arm. "Cave puntum" (Beware of the Sting.) On a field barry wavy of 8 white and blue, a wasp proper. (Right) Badge of No. 831 Squadron, Naval Air Arm. "Aquila non capit muscas." (Eagles don't catch flies). On a white field, issuant from water barry wavy in base blue and white a clenched gauntlet proper upon which is perched an eagle black. (The Squadron's own design.)

SERVICE AVIATION

F/O. D. EASTON, R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.
F/O. P. F. FISCHER, R.A.F.V.R., No. 35 Sqn.
F/O. W. J. FRANKS, R.A.F.V.R., No. 619 Sqn.
F/O. C. S. GEORGE, R.A.F.V.R., No. 550 Sqn.
F/O. T. H. GOODER, R.A.F.V.R., No. 102 Sqn.
F/O. R. F. GRAIN, R.A.F.V.R., No. 571 Sqn.
F/O. D. C. BEALE GUNNER, R.A.F., No. 7 Sqn.
F/O. D. H. HALLIWELL, R.A.F.V.R., No. 199 Sqn.
F/O. R. J. HANNAFORD, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
F/O. D. J. HARRILD, R.A.F., No. 635 Sqn.
F/O. I. L. C. HEAMES, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
F/O. S. HIRD, R.A.F.V.R., No. 7 Sqn.
F/O. W. G. JEFFERY, R.A.F.V.R., No. 7 Sqn.
F/O. E. GWYN JONES, R.A.F.V.R., No. 162 Sqn.
F/O. F. S. JONES, R.A.F.V.R., No. 192 Sqn.
F/O. P. E. LAKE, R.A.F.V.R., No. 415 (R.C.A.F.) Sqn.
F/O. S. LAWTON, R.A.F.V.R., No. 115 Sqn.
F/O. F. LAYTON, R.A.F.V.R., No. 162 Sqn.
F/O. F. E. H. LIGHTBODY, R.A.F.V.R., No. 102 Sqn.
F/O. J. L. LLOYD, R.A.F.V.R., No. 578 Sqn.
P/O. K. C. MCPHIE, R.A.A.F., No. 57 Sqn.
W/O. K. MORETON (later P/O.), R.A.A.F., No. 57 Sqn.
Flt. Lt. F. R. BARTLETT, R.C.A.F., No. 414 (R.C.A.F.) Sqn.
Flt. Lt. E. S. DUNN, R.C.A.F., No. 430 (R.C.A.F.) Sqn.
Flt. Lt. H. J. H. HARDY, R.C.A.F., No. 440 (R.C.A.F.) Sqn.
Flt. Lt. F. A. JOHNSON, R.C.A.F., No. 418 (R.C.A.F.) Sqn.
Flt. Lt. J. G. E. SAVARD, R.C.A.F., No. 440 (R.C.A.F.) Sqn.
Flt. Lt. R. E. SPOONER, R.C.A.F., No. 438 Sqn.
Flt. Lt. D. A. B. SMILEY, R.C.A.F., No. 64 Sqn.
F/O. N. BROWN, R.C.A.F., No. 194 Sqn.
F/O. J. H. CARPENTIER, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. F. M. COVERT, R.C.A.F., No. 433 (R.C.A.F.) Sqn.

THE KING has been graciously pleased to approve the following awards:—

Military Medal

Flt. Sgt. B. F. BROOKS, Provost and Security Unit.
Sgt. P. PITTMAN, Provost and Security Unit.
Cpl. P. L. A. SHORT, 2721 Field Sqn., R.A.F.R.

Roll of Honour

Casualty Communiqué No. 533.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 151 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—W/O. A. Amos; Sgt. V. H. Andrews; Sgt. P. S. Armitage; Flt. Sgt. A. Ashton; Sgt. J. L. Bird; Act. F/O. S. G. Chopping; Flt. Sgt. J. S. Davies; Flt. Sgt. G. H. Elliott; Flt. Lt. W. J. Henri; Sgt. W. F. Heywood; P/O. D. J. Hovell; Flt. Sgt. D. G. Lewis; Flt. Sgt. J. E. Livick; Flt. Sgt. M. S. G. Mumford; Sgt. W. J. Ormshaw; Flt. Lt. L. C. Raw; P/O. M. E. M. Ray; F/O. J. Rhodes; F/O. F. J. Ricketts, D.F.M.; Sgt. J. H. Taylor; Flt. Lt. S. Thompson, A.F.C.; Sgt. C. G. Welsh; Sgt. G. Williams; Sgt. P. C. Wiseman.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. P. J. Birt; Sgt. R. A. Duffield; F/O. J. Dunn, D.F.M.; Sgt. R. England; Sgt. K. E. Gronow; Sgt. T. J. Simpson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Act. Flt. Lt. R. R. G. Appleby, D.F.C.; Sgt. J. F. Barton; Sgt. E. G. Berry; Sgt. D. A. Bristow; Sgt. F. P. Brown; Sgt. G. W. Bumstead; F/O. L. A. Chandler; F/O. P. E. Chilman; Flt. Sgt. J. L. Davison; Sgt. R. E. Digby; Sgt. S. N. Dougan; Sgt. M. Duncan; F/O. A. C. Elliott; Flt. Sgt. J. C. Garratt; Sgt. J. W. Germing; Sgt. W. J. Gilchrist; Flt. Sgt. S. W. Godden; F/O. P. T. Green; Flt. Sgt. A. W. Habergham; Flt. Sgt. J. L. Harden; Flt. Sgt. J. C. Harold; Sgt. S. Haslett; Flt. Sgt. E. F. Hill-Cottingham; P/O. D. H. Hogg; Sgt. A. H. Hudson; Flt. Sgt. N. Jackson; Flt. Sgt. D. S. James; Flt. Sgt. N. H. Johnson; Flt. Sgt. E. S. Jones; Flt. Sgt. J. J. Jones; F/O. N. C. Jones; P/O. J. S. Kilgour; F/O. J. H. Lamb; F/O. B. A. Lambert; F/O. N. T. Lawrence; Sgt. R. J. MacDonald; Flt. Sgt. A. H. McGill; Sqn. Ldr. T. O. Marshall, D.F.C.; Wing Cdr. M. T. Maw, D.F.C.; Sgt. R. Middleton; F/O. F. M. Miffin; Flt. Sgt. E. Millar; Sgt. A. R. Morgan; Flt. Sgt. L. Morgan; Sgt. L. Morgan; Flt. Sgt. T. L. Oakes; Sgt. W. O'Donnell; Sgt. R. H. F. Ogborne; P/O. A. R. Oxenham; Flt. Sgt. H. Pollard; Flt. Sgt. V. B. Prime; F/O. T. H. Rees; Flt. Sgt. D. L. Reynolds; Flt. Sgt. V. A. Sanderson; Sgt. H. W. L. Smith; Flt. Sgt. W. A. Sullock; Sqn. Ldr. P. M. Wigg.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. V. Hinder.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. K. Butler.

WOUNDED OR INJURED IN ACTION.—F/O. A. G. R. Ashley; F/O. V. J. A. Collard; Flt. Sgt. J. G. Hyam; Sgt. N. Stevenson; Flt. Sgt. H. S. Woodrow.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. E. R. P. Adams; Flt. Lt. O. J. Clipsham, D.F.C.; Flt. Sgt. W. F. Graham; F/O. T. J. Hedley; Flt. Sgt. O. G. Jones; Flt. Lt. A. W. Shearer, D.F.C.; F/O. S. J. Smith.

MISSING.—F/O. T. S. Akenhead; Flt. Sgt. E. Atterby; F/O. G. J. Austin; F/O. D. S. Barr; Sgt. J. L. Beard; Flt. Sgt. T. J. Bicknell; Flt. Sgt. N. Bott; F/O. F. J. Brickman; Flt. Sgt. R. H. Brown; Sgt. F. J. Carolan; Act. Flt. Lt. H. Chapman; F/O. A. W. Clark; F/O. P. C. H. Clark; Flt. Sgt. W. R. Clydesdale; Sgt. H. O. Collin; Flt. Sgt. A. J. Crampin; Sgt. J. W. Cross; Flt. Sgt. T. J. Crossman; Sgt. C. J. Dewdney; Flt. Sgt. F. H. Ebbage; Sgt. A. G. Evans; Sgt. W. A. Frost; Sgt. R. Gamble; Sgt. R. C. Gilbert; Sgt. A. K. Goodall; Flt. Sgt. C. T. Hall; Sgt. W. J. K. Holland; Sgt. J. L. Kerr; Sgt. M. F. Kingdom; Sgt. T. A. Lawton; Flt. Sgt. C. A. Lee; Sgt. C. A. Longstaff; Sgt. J. McBeth; Flt. Sgt. G. Matsumoto; Sgt. G. R. J. Miles; Sgt. J. Nichol; Sgt. B. H. Nicholl; Sgt. R. C. Pain; Sgt. F. Parkins; Flt. Lt. E. G. Parsons; Flt. Lt. D. V. Pattison; P/O. J. M. Peace; Sgt. W. Phinn; Fyt. Sgt. J. W. Purdy; Flt. Sgt. F. Pygram; Flt. Sgt. E. Ramsay; Sgt. R. N. Seager Sgt. M. Sills; F/O. J. D. Smith; F/O. J. M. Squance; Flt. Sgt. D. Stewart; Flt. Sgt. C. I. Stocker; F/O. A. S. Thomson; Flt Sgt. W. H. Tromp; Flt. Sgt. J. R. Weaver; F/O. D. G. Webb; P/O. S. T. Wells; P/O. R. W. West; W/O. F. S. Wilsher.

KILLED ON ACTIVE SERVICE.—Sgt. D. A. Charles; Sgt. W. E. Durber; Sgt. W. F. H. Elcome; Flt. Sgt. C. S. Jones; Flt. Sgt. W. W. King; A/C.2 W. G. M. Mann; Flt. Sgt. J. A. Mason; Flt. Sgt. R. F. Neale; A/C.2 H. Price; Sgt. H. Rollins; A/C.2 C. J. Russell; A/C.2 F. Salkeld; A/C.2 G. N. Sargent; Sgt. H. Shaw.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. T. E. P. O'Connor.

DIED ON ACTIVE SERVICE.—Act. Cpl. J. Bates; L.A/C. J. E. Gibson; A/C.1 C. W. R. Reynolds; Cpl. B. Slater; L.A/C. F. Turner.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/C. W. G. M. Edgar.

Royal Australian Air Force

F/O. N. M. McNulty.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. S. H. Davies; Flt. Sgt. A. G. Jasper; Flt. Sgt. N. E. Marsh; P/O. H. B. Shaw.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. H. Bell; Flt. Sgt. W. D. Carlile; Act. Flt. Lt. L. D. Curnow; P/O. K. W. Evans; Flt. Sgt. E. J. Fowler; Flt. Sgt. P. W. B. Gurdon; Flt. Sgt. S. G. Hill; Flt. Sgt. W. J. Howiss; P/O. A. J. Jubb; Flt. Sgt. A. W. J. Kempnich; W/O. R. J. King; W/O. H. Krone; P/O. L. A. Lawson; Flt. Sgt. E. G. Lee; Flt. Sgt. J. O. Lewis; Flt. Sgt. R. T. Lightbody; Flt. Sgt. I. McGugan; P/O. R. C. Martin; P/O. G. E. Parkinson; Flt. Sgt. J. G. Russell; Flt. Sgt. R. C. Sherwood; F/O. I. J. Thompson; F/O. M. S. Thorpe; F/O. N. J. Williams.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. C. F. Allen; Act. F/O. T. E. Davis.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. G. R. Conley.

MISSING.—W/O. R. McP. Bairnsfather; P/O. F. G. Grey; Flt. Sgt. J. W. Grice; Act. F/O. E. T. Jetson; W/O. W. B. Judd; F/O. R. A. Lewis; Flt. Sgt. A. T. J. Lovett; Act. Flt. Lt. W. H. P. Mitchell; F/O. R. W. G. Stark.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. J. L. Gilbert.

Royal Canadian Air Force

KILLED IN ACTION.—P/O. E. B. Boyce; Flt. Sgt. J. G. Paxton.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. L. H. Hopper; P/O. N. Novack; P/O. L. A. Peers; P/O. J. K. Stenhouse; Flt. Lt. F. W. Ward.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. M. L. Abramson; F/O. R. W. Archer; F/O. J. G. Avon; F/O. A. Bain; F/O. P. J. Biollo; P/O. H. T. B. Burgess; P/O E. L. Colp; F/O. A. Van D. Corless; P/O. A. D. Creighton; F/O. R. W. J. Cuff; W/O. J. Dingwall; F/O. J. K. Greenway; F/O. Q. T. R. Grierson; P/O. J. R. C. Gutcher; F/O. J. T. Guthrie; Flt. Lt. W. J. Harper; F/O. C. W. Hostetler; F/O. V. J. Hubbard; Sgt. N. E. Hyt; F/O. F. H. Lang; Sqn. Ldr. G. B. Latimer; F/O. A. Lindsay; P/O. M. A. Lowick; F/O. C. F. McDougal; W/O. J. A. MacLennan; Flt. Sgt. J. F. Mars; Sgt. J. F. Mireault; F/O. E. L. Morrison; Flt. Sgt. F. M. Omoe; Flt. Sgt. M. J. Petrina; F/O. P. M. Roche; Flt. Sgt. A. W. Roseland; F/O. G. E. Sholte; F/O. B. A. Somers; Flt. Sgt. A. C. Sutherland; P/O. L. A. Tarpley; P/O. R. B. Thompson; P/O. J. Unger; P/O. R. R. Vatcher; Flt. Lt. W. H. Way; F/O. J. E. West; P/O. J. E. Williams; F/O. H. E. Wilson; P/O. W. A. Younie; Flt. Lt. J. Zavitz; F/O. W. R. Zeller.

WOUNDED OR INJURED IN ACTION.—Sgt. W. F. Larson.

MISSING.—F/O. D. W. Bateman; F/O. C. P. Boyle; Flt. Sgt. T. G. Campbell; Flt. Sgt. W. R. Cookson; W/O. J. Corman; Flt. Lt. G. F. Coward; Flt. Sgt. H. Cuthbertson; F/O. C. W. Hall; F/O. G. A. Hoggard; Flt. Lt. R. H. Hunter; F/O. G. A. M. Maxon; Flt. Lt. J. A. Miller; Flt. Sgt. W. G. Roberts; Flt. Sgt. J. L. Rochester; Flt. Sgt. J. Street.

DIED ON ACTIVE SERVICE.—L.A/C. J. M. Belanger.

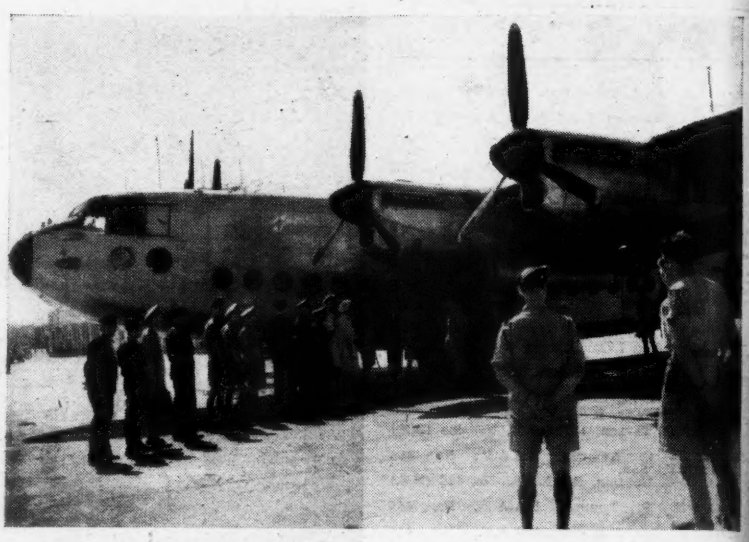
Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. R. Pepper; Flt. Sgt. P. N. Vercoe.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. M. R. Henderson; F/O. E. W. McLachlen.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—W/O. I. W. Butler.

MISSING.—Flt. Sgt. L. J. Cuttance; Flt. Sgt. A. L. A. Oakey.



TRANSPORT COMMAND AIRWAYS: Yorks of Transport Command fly a regular passenger and freight service from England to the Far East. Passengers are seen boarding a York at the first stop on the route—Malta.